

November 30, 2011

Ray Pilapil, Manager Illinois Environmental Protection Agency Bureau of Air, Compliance Section #40 1021 North Grand Avenue East Springfield, Il 62702

Re: Annual Compliance Test Report
Flare Performance Testing
Cottonwood Hills Recycling and Disposal Facility

Dear Mr. Pilapil:

Aquaterra Environmental Solutions, Inc. (Aquaterra) on behalf of our client, Waste Management of Illinois, Inc., is submitting the attached report of the *Open Flare Annual Test Report, Cottonwood Hills Recycling and Disposal Facility, Marissa, Illinois* dated November 2011. Please contact us at (618) 628-2001 with any questions or comments regarding this report.

Sincerely,

Aquaterra Environmental Solutions, Inc.

Tia Jeter, P.E. √o↑

Project Manager

Andrew Limmer, P.G. Senior Project Manager

Enclosures

C: Ernest Dennison, P.E. - Waste Management of Illinois, Inc. Kevin Mattison – IEPA Bureau of Air – Des Plaines Office John Justice – IEPA Bureau of Air – Collinsville Office

OPEN FLARE ANNUAL TEST REPORT COTTONWOOD HILLS RECYCLING AND DISPOSAL FACILITY MARISSA, ILLINOIS

Aquaterra Project Number 4733.10 November 2011

Prepared For:

Waste Management of Illinois, Inc. 601 Madison Avenue East St. Louis, Illinois 62201

AQUATERRA

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OPEN FLARE ANNUAL TEST REPORT COTTONWOOD HILLS RECYCLING AND DISPOSAL FACILITY MARISSA, ILLINOIS NOVEMBER 2011

1.0 INTRODUCTION

Aquaterra Environmental Solutions, Inc. (Aquaterra) was retained by Waste Management of Illinois, Inc., to perform the 2011 annual sampling of the open flare at the Cottonwood Hills Recycling and Disposal Facility (Cottonwood Hills RDF) located in Marissa, Illinois. The flare testing was performed in accordance with the requirements of the Illinois Environmental Protection Agency (IEPA), New Source Performance Standards (NSPS), and Construction Permit No. 06100058. Robert Hill, Jerry Jordan and Tim Pool of Aquaterra performed the Cottonwood Hills RDF flare testing on June 7, 2011, October 26, 2011, and November 8, 2011, respectively.

2.0 FIELD ACTIVITIES

The Cottonwood Hills RDF landfill gas collection and control system is routed to a landfill gas open flare. The open flare is used for the destruction of landfill gas and the control of landfill gas emissions. The flare was installed per Construction Permit No. 06100058 and began operation on February 5, 2008. The flare was continually operated with a flame present at all times during the test period.

Three test events were conducted on the open flare. The test events were completed in June 2011, October 2011 and November 2011. The visual test of the open flare emissions was conducted during the October 2011 event. Landfill gas samples were collected for laboratory analyses during each test event. Copies of the Cottonwood Hills RDF flare testing field logs are presented in Appendix A. Field testing information including sampling times and flare system performance data are recorded on the field logs.

Samples CW-1, CW-2, and CW-3 were collected on June 7, 2011 and samples CW-4, CW-5 and CW-6 were collected on October 26, 2011. The landfill gas samples were collected under vacuum at the Cottonwood Hills RDF flare inlet using evacuated stainless steel tanks (Summa canisters). A calibrated flow control regulator was used to regulate the flow of landfill gas at the approximate flow rate of 100 milliliters per minute into each evacuated Summa canister. The landfill gas sample canisters were delivered to Columbia Analytical Services (CAS) in Simi Valley, California for laboratory analysis of net heating value, nonmethane organic compounds (NMOCs) and fixed gas analysis per ASTM D3588-98, and

EPA Method 25C and Method 3C. Copies of the laboratory reports are presented in Appendix B.

Additional landfill gas samples CW 1, CW 2, CW 3, CW 4, CW 5 and CW 6 were collected on June 7, 2011 and November 8, 2011. These landfill gas samples were collected using 1.0 Liter Tedlar bags at the sample port located on the Cottonwood Hills RDF flare inlet. The landfill gas samples were delivered to CAS for analysis of sulfur compounds per ASTM D5504-08. Copies of the laboratory reports are presented in Appendix B.

3.0 ANALYSIS AND RESULTS

The Cottonwood Hills RDF flare testing was performed in accordance with Construction Permit No. 06100058, NSPS, and the relevant guidelines for test methods provided at 40 CFR Part 60, Appendix A. A discussion of the results is provided in the following sections.

3.1 Visible Emissions

Visible emissions (opacity) testing of the Cottonwood Hills RDF flare was performed on October 26, 2011, in accordance with USEPA Method 22, *Determination of Fugitive Emissions from Material Sources and Smoke Emissions from Flares.* The visual emissions from the open flare were continuously monitored for a 2-hour timeframe and documented at 5-minute intervals. A 5-minute rest period occurred after each 20-minute observation period. The Method 22 test result for the Cottonwood Hills RDF flare are summarized on the Method 22 Testing Field Logs presented in Appendix A. The results of the visible emissions test indicated no detectable visible emissions from the Cottonwood Hills RDF flare, therefore, the flare was operated within the maximum permitted emission limit. A summary of the acceptable Cottonwood Hills RDF flare visible emissions testing results is presented as follows.

Actual Visible	Allowable Visible
Emission Event per 2 hours	Emission Event per 2 hours
0 seconds	5 minutes

3.2 Fuel Heating Value

Six of the landfill gas samples collected during the June 2011 and October 2011 events were analyzed for net heating value by ASTM Method D3588 and fixed gases per EPA Method 3C. The results of the laboratory analyses are provided in Appendix B. The results of the Method 3C analysis for sample CW-3 collected on June 7, 2011 indicate air intrusion

possibly occurred in the Summa canister as the nitrogen and oxygen concentrations in the canister are 76% and 22% respectively. This air intrusion more than likely occurred prior to the sample collection, possibly during canister shipment, as there was minimal vacuum in the canister prior to sample collection. As such, the sample analyzed is not indicative of the true quality of gas being combusted in the landfill flare. Therefore, the results of the analysis of sample CW-3 collected on June 7, 2011 are not considered valid and will not be discussed further in this report.

The laboratory heating value analysis indicated the net heating value of the landfill gas at the time of sample collection was in compliance with the minimum requirements as described in 40 CFR 60.18(c)(3)(ii). The net heating value of the landfill gas during the test events was also calculated based on the concentration of methane in the landfill gas, in accordance with 40 CFR 60.18(f)(3) and 40 CFR 60.754(e). Per 40 CFR 60.754(e), the net heating value of combusted landfill gas is calculated from the concentration of methane in the landfill gas as measured by EPA Method 3C. The measurement of other organic components, hydrogen, and carbon monoxide is not applicable. The results of the net heating value calculation comply with the requirements of 40 CFR 60.18(c)(3)(ii) and not surprisingly are slightly less than the laboratory measured values. This is due to the fact that the calculation considers the heating value of only the methane portion of the landfill gas, while the laboratory analysis considers the heating value of all components of landfill gas contributing to the net heating value, including methane and other organic compounds. Detailed calculations are provided in Appendix C. A summary of the laboratory results, calculated heating values and allowable heating value for the Cottonwood Hills RDF flare is presented in the following table.

Date	Run No.	Laboratory Analytical Heating Value (MJ/scm)	Calculated Heating Value (MJ/scm)	Minimum Allowable Heating Value (MJ/scm)
6/7/11	CW-1	17.7	17.1	7.45
6/7/11	CW-2	19.4	19.1	7.45
10/26/11	CW-4	16.7	16.5	7.45
10/26/11	CW-5	16.8	16.4	7.45
10/26/11	CW-6	16.6	16.3	7.45

MJ/scm: Mega joule per standard cubic meter

3.3 Fixed Gas Analysis

Per the requirements of Construction Permit No. 06100058, landfill gas samples collected during the June 2011 and October 2011 events were analyzed for fixed gases, including

methane and carbon monoxide, by EPA Method 3C. The results of the analysis, reported as percent by volume (%), are provided in the following table.

Date Collected	6/7/2	2011	1	Avorago		
Parameter	CW-1	CW-2	CW-4	CW-5	CW-6	Average
Hydrogen	0.8%	0.8%	0.7%	0.7%	0.7%	0.8%
Oxygen	2.8%	0.6%	1.7%	1.8%	2.0%	1.8%
Nitrogen	8.5%	0.7%	12.1%	12.3%	12.9%	9.3%
Carbon Monoxide	ND	ND	ND	ND	ND	ND
Methane	51.4%	57.1%	49.4%	49.3%	48.7%	51.2%
Carbon Dioxide	36.5%	40.6%	35.9%	35.8%	35.5%	36.9%

ND: Not detected at or above the reporting limit

3.4 NMOC Analysis

Per the requirements of Construction Permit No. 06100058, landfill gas samples collected during the June 2011 and October 2011 events were analyzed for NMOCs by EPA Method 25C. The results of the analysis are provided in the table below and indicate an average NMOC content of 6,380 parts per million by volume.

Date	Run No.	NMOC Content (ppmv)
6/7/11	CW-1	6,700
6/7/11	CW-2	7,800
10/26/11	CW-4	5,500
10/26/11	CW-5	5,800
10/26/11	CW-6	6,100
Av	erage	6,380

ppmv: parts per million by volume

3.5 Sulfur Compounds Analysis

A total of six landfill gas samples collected during the June 2011 and November 2011 events were analyzed for twenty Sulfur compounds, including hydrogen sulfide, by ASTM Method D 5504-08. The results of the laboratory analyses are provided in Appendix B. The average sulfur content for the samples analyzed was 47.6 ppmv. A summary of the sulfur compounds tested for and their concentrations is provided on the following table.

Date collected	Linita	6/7/2011			11/8/2011			
Parameter	Units	CW 1	CW 2	CW 3	CW 4	CW 5	CW 6	
Hydrogen Sulfide	ppbv	28,000	30,000	26,000	20,000	24,000	23,000	
Carbonyl Sulfide	ppbv	97	100	85	120	120	110	
Methyl Mercaptan	ppbv	5,700	5,900	5,100	5,500	6,200	6,000	
Ethyl Mercaptan	ppbv	140	150	120	150	170	170	
Dimethyl Sulfide	ppbv	13,000	13,000	11,000	16,000	16,000	16,000	
Carbon Disulfide	ppbv	53	58	46	90	92	88	
Isopropyl Mercaptan	ppbv	380	400	340	470	520	500	
tert-Butyl Mercaptan	ppbv	650	660	550	730	760	720	
n-Propyl Mercaptan	ppbv	54	57	43	55	63	60	
Ethyl Methyl Sulfide	ppbv	110	120	96	150	150	140	
Thiophene	ppbv	430	450	380	530	580	560	
Isobutyl Mercaptan	ppbv	120	120	100	150	160	150	
Diethyl Sulfide	ppbv	18	20	14	20	19	17	
n-Butyl Mercaptan	ppbv	63	64	48	72	79	78	
Dimethyl Disulfide	ppbv	13	12	10	82	54	49	
3-Methylthiophene	ppbv	98	100	87	130	130	130	
Tetrahydrothiophene	ppbv	19	19	16	26	25	24	
2,5-Dimethylthiophene	ppbv	ND	ND	ND	9	11	10	
2-Ethylthiophene	ppbv	10	11	ND	10	13	12	
Diethyl Disulfide	ppbv	ND	ND	ND	ND	ND	ND	
Total Per Sample	ppbv	48,955	51,241	44,035	44293.9	49146	47818	
Average	ppmv			47	.6			

ppbv: parts per billion by volume ppmv: parts per million by volume

ND: Not detected at or above reporting limit

APPENDIX A

FIELD LOGS



Sampler	Robert Hill	•		
Date	6/7/2011			
Sample I.D.	CW-1			
Canister I.D.	ISC00246	•		
Canister Vol.	1.0	liter		
Tedlar Bag I.D.	90675-41296	•		
Sample Vol.	0.5	liter		
Temperature Me	easurements			
	Flare Temp.*		1314	Deg. F
	Gas Temp.**		145.2	Deg. F
	* Measured with CA	T 12	3-6700 Infra	ared Thermometer II with Laser Sighting
	** Measured with in	-line 1	thermomete	er
Pressure Measu	rement			
	Static Pressure*		0.00	Inches H ₂ 0
	* Measured with Sh	ortrid	ge Instrume	ents, Inc. Airdata Multimeter ADM 860 #M00577
Summa Caniste	r Vacuum Readings			
	Initial Vacuum		-94	Inches Hg
	Final Vacuum		-8	_ Inches Hg
	Start Time		13:30	
	End Time		13:45	- -

Sampler	Robert Hill	ı			
Date	6/7/2011				
Sample I.D.	CW-2	1			
Canister I.D.	ISC00063				
Canister Vol.	1.0	liter			
Tedlar Bag I.D.	90675-41301	ı			
Sample Vol.	0.5	liter			
Temperature Me	easurements				
•	Flare Temp.*		1434	Deg. F	
	Gas Temp.**		145.2	Deg. F	
		T 12	3-6700 Inf	ared Thermometer II wi	th Laser Sighting
	** Measured with in				G G
Pressure Measu	rement				
	Static Pressure*		0	Inches H ₂ 0	
	* Measured with Sh	ortrid	lge Instrun	ents, Inc. Airdata Multir	neter ADM 860 #M00577
Summa Caniste	r Vacuum Readings				
	Initial Vacuum		-100	_ Inches Hg	
	Final Vacuum		-9	Inches Hg	
	Start Time		13:49	_	
	Fnd Time		14:06		

Sampler	Robert Hill	
Date	6/7/2011	
Sample I.D.	CW-3	•
Canister I.D.	ISC00774	
Canister Vol.	1.0	liter
Tedlar Bag I.D.	90675-41299	
Sample Vol.	0.5	liter
Temperature Me	easurements	
•	Flare Temp.*	Deg. F
	Gas Temp.**	Deg. F
	* Measured with CA	AT 123-6700 Infrared Thermometer II with Laser Sighting
	** Measured with in	-line thermometer
Pressure Measu	ırement	
	Static Pressure*	Inches H ₂ 0
	* Measured with Sh	ortridge Instruments, Inc. Airdata Multimeter ADM 860 #M00577
0 0 11		
Summa Caniste	r Vacuum Readings	In all and I I in
	Initial Vacuum	Inches Hg
	Final Vacuum	Inches Hg
	Start Time	
	End Time	

Sampler	Jerry Jordan	_					
Date	10/26/2011						
Sample I.D.	CW-4	_					
Canister I.D.	ISC00198	_					
Canister Vol.	1.0	liter					
Tedlar Bag I.D.	NA	<u>.</u> =.					
Sample Vol.	NA	liter					
Temperature Me	easurements						
•	Flare Temp.*		1393	Deg. F			
	Gas Temp.**		120	Deg. F			
	* Measured with CA	T 12	3-6700 Inf		ometer II v	ith Laser	Sighting
	** Measured with in						
Pressure Measu	ırement						
	Static Pressure*		1.6	Inches	H_20		
	* Measured with Sh	ortrid	lge Instrur	nents, Inc. Ai	irdata Multi	meter AD	M 860 #M00577
Summa Caniste	r Vacuum Readings						
	Initial Vacuum		-22	Inches	Hg		
	Final Vacuum		-3.5	Inches	Hg		
	Start Time		11:45	_			
	Fnd Time		11:58				

Sampler	Jerry Jordan
Date	10/26/2011
Sample I.D.	CW-5
Canister I.D.	ISC00067
Canister Vol.	1.0 liter
Tedlar Bag I.D.	NA NA
Sample Vol.	NA liter
	·
Temperature Me	
	Flare Temp.*1390 Deg. F
	Gas Temp.** <u>120</u> Deg. F
	* Measured with CAT 123-6700 Infrared Thermometer II with Laser Sighting
	** Measured with in-line thermometer
Pressure Measu	ırement
Trocouro mouco	Static Pressure* 1.5 Inches H ₂ 0
	* Measured with Shortridge Instruments, Inc. Airdata Multimeter ADM 860 #M00577
	modelica mai enclarage medamente, men mata matameter / Em ecc //meecr
Summa Caniste	er Vacuum Readings
	Initial Vacuum Inches Hg
	Final Vacuum -5 Inches Hg
	Start Time 12:25
	End Time12:39

Sampler	Jerry Jordan	_							
Date	10/26/2011	_							
Sample I.D.	CW-6	•							
Canister I.D.	ISC00803	<u> </u>							
Canister Vol.	1.0	liter							
Tedlar Bag I.D.	NA	<u>-</u>							
Sample Vol.	NA	liter							
Temperature Me	easurements								
romporataro irre	Flare Temp.*		1392	Deg. F					
	Gas Temp.**			Deg. F					
	* Measured with CA	T 123		_	rmomete	r II with	Laser S	Siahtina	
	** Measured with in								
Dragoura Maga	ıramant								
Pressure Measu			4.0	مامسا	0				
	Static Pressure*		1.6		es H ₂ 0				
	* Measured with Sh	ıortridg	je Instrume	nts, Inc	. Airdata	Multime	ter ADN	√1 860 #N	M00577
Summa Caniste	r Vacuum Readings								
	Initial Vacuum		-29.5	Inch	es Hg				
	Final Vacuum		-5	Inch	es Hg				
	Start Time	,	12:50						
	End Time		13:02						

Sampler	Tim Pool	-			
Date	11/8/2011				
Sample I.D.	CW-4	_			
Canister I.D.	NA	-			
Canister Vol.	NA	liter			
Tedlar Bag I.D.	90675-46114	_			
Sample Vol.	0.5	liter			
Temperature Me				_	
	Flare Temp.*		898	Deg. F	
	Gas Temp.**		112	Deg. F	
					r II with Laser Sighting
	** Measured with in	i-line t	thermomete	٢	
Pressure Measu	ırement				
i roccaro mode	Static Pressure*		_	Inches H ₂ 0	
	* Gauge was down			111011001120	
	Gauge was down				
Summa Caniste	r Vacuum Readings				
	Initial Vacuum			Inches Hg	
	Final Vacuum			Inches Hg	
				3	
	Start Time				
	Fnd Time				

Sampler	Tim Pool		
Date Sample I.D. Canister I.D. Canister Vol. Tedlar Bag I.D. Sample Vol.	11/8/2011 CW-5 NA NA 90675-46309 0.5	liter	
Temperature Me		024	D
	Flare Temp.* Gas Temp.** * Measured with CAT ** Measured with in-lin	112 123-6700 Infrared	Deg. F Deg. F Thermometer II with Laser Sighting
Pressure Measu	rement		
	Static Pressure* * Gauge was down	-	Inches H ₂ 0
Summa Canister	Vacuum Readings Initial Vacuum Final Vacuum		Inches Hg Inches Hg
	Start Time		

Sampler	Tim Pool						
Date Sample I.D. Canister I.D. Canister Vol. Tedlar Bag I.D. Sample Vol.	11/8/2011 CW-6 NA NA 90675-46123 0.5	liter					
Temperature Me	easurements Flare Temp.* Gas Temp.** * Measured with CA ** Measured with in	T 123-			ometer II v	vith Laser	Sighting
Pressure Measu	rement Static Pressure* * Gauge was down		-	Inches I	⊣ ₂0		
Summa Caniste	r Vacuum Readings Initial Vacuum Final Vacuum Start Time End Time			Inches Inches	-		

APPENDIX B LABORATORY REPORTS





LABORATORY REPORT

July 1, 2011

Tom Jacobsmeyer Aquaterra Environmental Solutions, Inc. 13 Executive Dr., Suite 1 Fairview Heights, IL 62208

RE: 2011 Cottonwood RDF Flare

Dear Tom:

Enclosed are the results of the samples submitted to our laboratory on June 20, 2011. For your reference, these analyses have been assigned our service request number P1102313.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAPaccredited analytes, refer to the certifications section at www.caslab.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

Columbia Analytical Services, Inc. is certified by the California Department of Health Services, NELAP Laboratory Certificate No. 02115CA; Arizona Department of Health Services, Certificate No. AZ0694; Florida Department of Health, NELAP Certification E871020; New Jersey Department of Environmental Protection, NELAP Laboratory Certification ID #CA009; New York State Department of Health, NELAP NY Lab ID No: 11221; Oregon Environmental Laboratory Accreditation Program, NELAP ID: CA20007; The American Industrial Hygiene Association, Laboratory #101661; United States Department of Defense Environmental Laboratory Accreditation Program (DoD-ELAP), Certificate No. L10-3-R1; Pennsylvania Registration No. 68-03307; TX Commission of Environmental Quality, NELAP ID T104704413-11-2; Minnesota Department of Health, NELAP Certificate No. 219474; Washington State Department of Ecology, ELAP Lab ID: C946. Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact me for information corresponding to a particular certification.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

Columbia Analytical Services, Inc.

Sue Anderson Project Manager



Client: Aquaterra Environmental Solutions, Inc. CAS Project No: P1102313

2011 Cottonwood RDF Flare Project:

CASE NARRATIVE

The samples were received intact under chain of custody on June 20, 2011 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

BTU and CHONS Analysis

The results for BTU and CHONS were generated according to ASTM D 3588-98. The following analyses were performed and used to calculate the BTU and CHONS results.

C2 through C6 Hydrocarbon Analysis

The samples were analyzed according to modified EPA Method TO-3 for C₂ through >C₆ hydrocarbons using a gas chromatograph equipped with a flame ionization detector (FID).

Fixed Gases Analysis

The samples were also analyzed for fixed gases (hydrogen, oxygen/argon, nitrogen, carbon monoxide, methane and carbon dioxide) according to ASTM D 1946 using a gas chromatograph equipped with a thermal conductivity detector (TCD).

Hydrogen Sulfide Analysis

The were also analyzed for hydrogen sulfide per ASTM D 5504-08 using a gas chromatograph equipped with a sulfur chemiluminescence detector (SCD).

Total Gaseous Non-Methane Organics as Methane Analysis

The samples were also analyzed for total gaseous non-methane organics as methane according to modified EPA The analyses included a single sample injection (method modification) analyzed by gas chromatography using flame ionization detection/total combustion analysis.

The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for utilization of less than the complete report.

Use of Columbia Analytical Services, Inc. (CAS) Name. Client shall not use CAS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to CAS any test result, tolerance or specification derived from CAS's data ("Attribution") without CAS's prior written consent, which may be withheld by CAS for any reason in its sole discretion. To request CAS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If CAS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use CAS's name or trademark in any Materials or Attribution shall be deemed denied. CAS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of CAS's name or trademark may cause CAS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.



DETAIL SUMMARY REPORT

Client: Aquaterra Environmental Solutions, Inc.

Project ID: 2011 Cottonwood RDF Flare

Date Received: Time Received: 09:30

6/20/2011

Service Request: P1102313

TO-3 M 3C Mod ASTM1 25C Modi	TO-3 Modified - C10	× 3C Modified - Fxd Ge	ASTM D5504-01 - F	25C Modified - TGNMO	
	TO-3 M	3C Mod	ASTM	25C Modi	

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	Container ID	Pi1 (psig)	Pf1 (psig)	TO-3 Iv	эс Мос	ASTM	25C Mod	
CW-1	P1102313-001	Air	6/7/2011	13:45	1SC00246	12.11	12.11	X	X	X	X	
CW-2	P1102313-002	Air	6/7/2011	14:06	1SC00063	12.01	12.01	X	X	X	X	
CW-3	P1102313-003	Air	6/7/2011	14:10	1SC00774	11.58	11.58	\mathbf{X}	\mathbf{X}	X	X	

TestAmerica Los Angeles

3585 Cadillac Ave., Suite A Costa Mesa, CA 92626 Phone 714-258-8610 Fax 714-258-0921

Canister Samples Chain of Custody Record



TestAmenca Laboratories, Inc. assumes no liability with respect to the collection and shipment of these samples.

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THE	LEAD	ER IN	ENVIR	ONMENT	AL TESTING
	<	211	1	2	17

Client Contact Information	Project Manager:	vor Homburs		AF-OF	24	tomorie de des desert				CO	Cs			***************************************	
Company Aguaterra Environmental	Danono / La Con La Sa	~- <i>,200 !</i>	Samples Collec	ted By:	Robe	+ P	4IN	1 C	11:	'n (a	<i>300</i>		AND INCOME BUT	
Address 13 Enoughe friend Ste 1 City/State/Zip Friend Heights, 1 6706 Phone: (6/8) 628 - 200/ FAX: (6/8) 628 - 2002 Project Name: 20/1 Cottonwood RDF E Site: Cottonwood Hills RDF Te	Site Contact: Rob LAB Contact: Sonia Analysis T	ent H. Hill 2 2 Tabletro Jurnaround Time							/ in notes section)		A PARTY CONTRACTOR OF THE PART			y in notes section)	
PO# N/A	Rush (Specify	/)	an-19-1	Ar Tables	-		-		specify					specify	
Sample Identification	Sample Date(s) Time Start	Canister Canis Vacuum in Vacuu Fleld, "Hg Fleld,	n in Hg Flow	nister ID	TO-15	10-3	EPA 3C	ASTM D-1946	Other (Please s	Sample Type	Indoor Air	Ambient Air	Landfill Gas	Other (Please s	
002-1	6/7/11/330	1345 -94 -8	AVGOLO89	2721			\times \rangle		X				X		+11,6
CW-1 CW-2		1406-100 -9	· · · · · · · · · · · · · · · · · · ·				X	/	X				X		4 11.8
Cu ~	6/7/11/410	28 -1	AVGOODS	11/11/2					X				1		4115
CW-S		- 23 1	HVIJEES	7723								The state of the s	 		of 15
												And the state of t			7
C.Y. ALL STATES	Interior	Temperature (Fahre	heit)		*B	TU	\mathcal{C}_{ϵ}	onto	21	- 1	157	u I	0358	28	
ALTERNATION OF THE PROPERTY OF	Start	936													
ACCURATION AND ADDRESS OF THE ACCURA	Stop	540													
A STATE OF THE PROPERTY AND A STATE OF THE PROPERTY OF THE PRO		Pressure (inches of	Hg)				STERNAL PROPERTY OF	spopodg gazmakká krosovila	ika mininga milawang sala	madalisticides mote		Employed Schools of the Selection of the	and the court to the last well the last		
EN PROPERTY CONTRACTOR	Interior	Ambient													
manufacture (A)	Start	29.9													
Special Instructions/QC Requirements & Comment Samples Shipped by	enslan	taneous d'invie.	es Received by:	rwoj	12	ac			j	j.C	24	J 9	ho		
Samples Relinquished by: Relinquished by:	Date/Time:	1100 Rece	ved by:			The state of the s		2 1	f						
Lab Use Only Shipper Name:	13/13/12 12	Opened by:	Condition:	wt	Cll	w	<u>د او</u>	rel	4	09	<u> </u>	PROCESS OF MINISTERS OF THE PROCESS	Total Manager and American	Account district and	r



Sample Acceptance Check Form

		vironmental Solutions	s; Inc.			Work order:	P1102313				
-	s) received on:	ood RDF Flare			Date opened:	6/20/11	by:	MZAN	1OR 4		
-		samples received by CAS.	The use of this for	E .							
		Thermal preservation and							<u>No</u>	<u>N/A</u>	
1	-	containers properly	marked with cl	ient sample II) ?			×			
2		supplied by CAS?						X			
3	Did sample co	ontainers arrive in go	ood condition?					X			
4	Were chain-o	f-custody papers used	d and filled out	?				X			
5	Did sample co	ontainer labels and/o	or tags agree w	ith custody pa	pers?					X	
6	Was sample v	olume received adeq	uate for analys	is?				X			
7	Are samples v	vithin specified holding	ng times?					X			
8	Was proper temperature (thermal preservation) of cooler at receipt adhered to?										
	Cooler Temperature °C Blank Temperature °C										
9	Was a trip bla	ank received?							X		
10	Were custody	seals on outside of c	ooler/Box?					П	X		
		Location of seal(s)?					Sealing Lid?			X	
	Were signatur	e and date included?								X	
	Were seals int	act?								X	
	Were custody	seals on outside of sa	imple containe	r?					X		
		Location of seal(s)?					Sealing Lid?			X	
	Were signatur	e and date included?						П		X	
	Were seals int	act?								X	
11	Do container	rs have appropriate p	reservation, a	ecording to me	ethod/SOP or	Client specified is	nformation?			X	
	Is there a clie	nt indication that the	submitted sam	ples are pH p	reserved?					X	
	Were VOA v	ials checked for prese	ence/absence o	f air bubbles?						X	
	Does the clien	nt/method/SOP requir	e that the analy	st check the s	ample pH and	d if necessary alte	r it?			X	
12	Tubes:	Are the tubes cap	ped and intact	?						X	
		Do they contain i	noisture?							X	
13	Badges:	Are the badges p		d and intact?						X	
		Are dual bed bad	ges separated a	and individual	ly capped and	d intact?				X	
Lab	Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)		ot / Prese			
P1102313	3-001.01	1.0 L Source Can									
P1102313	3-002.01	1.0 L Source Can									
P1102313	3-003.01	1.0 L Source Can									
Evnlair	any diserenane	ies: (include lab sample	ID numbers):		•						
_	-	ged; they were assigned		number indicate	ed on the COC	2.					
		ly shipped to another la					ed.				
RSK - MI	EEPP, HCL (pH<2); l	RSK - CO2, (pH 5-8); Sulfur (j	οH>4)								
P	1102313_Aquaterra Envi	ronmental Solutions, Inc2011 Co	tonwood RDF Flare.xls	- Page 1 of 1 5 of 15				7/1/11	3:41 PM		

WM00560



Page 1 of 1

Client: Aquaterra Environmental Solutions, Inc.

Client Sample ID: CW-1 CAS Project ID: P1102313 Client Project ID: 2011 Cottonwood RDF Flare CAS Sample ID: P1102313-001

Test Code: ASTM D3588-98

Analyst: Wade Henton/Dante Munoz-Castaneda Date Collected: 6/7/11 Sampling Media: 1.0 L Summa Canister Date Received: 6/20/11

Test Notes:

Container ID: 1SC00246

> Initial Pressure (psig): 12.11 Final Pressure (psig): 12.11

		Canister Dilution	Factor: 1.00
Components	Result	Result	Data
	Volume %	Weight %	Qualifier
Hydrogen	0.36	0.03	
Oxygen + Argon	1.32	1.52	
Nitrogen	56.77	57.09	
Carbon Monoxide	< 0.01	< 0.01	
Methane	24.27	13.97	
Carbon Dioxide	17.21	27.19	
Hydrogen Sulfide	< 0.01	< 0.01	
Ethane	< 0.01	< 0.01	
Propane	< 0.01	< 0.01	
Butanes	< 0.01	< 0.01	
Pentanes	0.01	0.04	
Hexanes	0.01	0.03	
> Hexanes	0.03	0.12	
TOTALS	99.99	99.99	

Components	Mole %	Weight %	
Carbon	14.34	18.00	
Hydrogen	33.91	3.57	
Oxygen + Argon	12.73	21.30	
Nitrogen	39.02	57.13	
Sulfur	< 0.10	< 0.10	

Specific Gravity (Air = 1)		0.9618	
Specific Volume	ft3/lb	13.62	
Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/ft3	249.6	
Net Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/ft3	224.8	
Gross Heating Value (Water Saturated at 0.25636 psia)	BTU/ft3	245.0	
Net Heating Value (Water Saturated at 0.25636 psia)	BTU/ft3	220.6	
Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/lb	3,400.7	
Net Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/lb	3,062.2	
Compressibility Factor "Z" (60 F, 14.696 psia)		0.9988	



Page 1 of 1

Client: Aquaterra Environmental Solutions, Inc.

Client Sample ID: CW-2 CAS Project ID: P1102313 Client Project ID: 2011 Cottonwood RDF Flare CAS Sample ID: P1102313-002

Test Code: ASTM D3588-98

Analyst: Wade Henton/Dante Munoz-Castaneda Date Collected: 6/7/11 Sampling Media: 1.0 L Summa Canister Date Received: 6/20/11

Test Notes:

Container ID: 1SC00063

> Initial Pressure (psig): 12.01 Final Pressure (psig): 12.01

		Canister Dilution	Factor: 1.00
Components	Result	Result	Data
	Volume %	Weight %	Qualifier
Hydrogen	0.40	0.03	-
Oxygen + Argon	0.27	0.31	
Nitrogen	52.43	52.82	
Carbon Monoxide	< 0.01	< 0.01	
Methane	27.37	15.79	
Carbon Dioxide	19.44	30.78	
Hydrogen Sulfide	< 0.01	< 0.01	
Ethane	< 0.01	< 0.01	
Propane	< 0.01	< 0.01	
Butanes	< 0.01	< 0.01	
Pentanes	0.01	0.04	
Hexanes	0.01	0.04	
> Hexanes	0.05	0.19	
TOTALS	99.99	99.99	

Components	Mole %	Weight %	
Carbon	15.58	20.40	
Hydrogen	36.80	4.04	
Oxygen + Argon	13.01	22.70	
Nitrogen	34.61	52.86	
Sulfur	< 0.10	< 0.10	

Specific Gravity (Air = 1)		0.9600	
Specific Volume	ft3/lb	13.65	
Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/ft3	282.2	
Net Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/ft3	254.1	
Gross Heating Value (Water Saturated at 0.25636 psia)	BTU/ft3	276.9	
Net Heating Value (Water Saturated at 0.25636 psia)	BTU/ft3	249.4	
Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/lb	3,851.6	
Net Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/lb	3,468.5	
Compressibility Factor "Z" (60 F, 14.696 psia)		0.9987	-



Page 1 of 1

Client: Aquaterra Environmental Solutions, Inc.

Client Sample ID: CW-3 CAS Project ID: P1102313 Client Project ID: 2011 Cottonwood RDF Flare CAS Sample ID: P1102313-003

Test Code: ASTM D3588-98

Analyst: Wade Henton/Dante Munoz-Castaneda Date Collected: 6/7/11 Sampling Media: 1.0 L Summa Canister Date Received: 6/20/11

Test Notes:

Container ID: 1SC00774

> Initial Pressure (psig): 11.58 Final Pressure (psig): 11.58

		Canister Dilution	Factor: 1.00
Components	Result	Result	Data
	Volume %	Weight %	Qualifier
Hydrogen	< 0.01	< 0.01	
Oxygen + Argon	11.48	12.91	
Nitrogen	88.00	86.58	
Carbon Monoxide	< 0.01	< 0.01	
Methane	0.28	0.16	
Carbon Dioxide	0.22	0.34	
Hydrogen Sulfide	< 0.01	< 0.01	
Ethane	< 0.01	< 0.01	
Propane	< 0.01	< 0.01	
Butanes	< 0.01	< 0.01	
Pentanes	< 0.01	< 0.01	
Hexanes	< 0.01	< 0.01	
> Hexanes	< 0.01	< 0.01	
TOTALS	99.99	99.99	

Components	Mole %	Weight %	
Carbon	0.25	0.21	
Hydrogen	0.56	< 0.10	
Oxygen + Argon	11.64	13.16	

87.54 86.59 Nitrogen Sulfur < 0.10< 0.10

Specific Gravity (Air = 1)		0.9830	
Specific Volume	ft3/lb	13.33	
Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/ft3	2.9	
Net Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/ft3	2.6	
Gross Heating Value (Water Saturated at 0.25636 psia)	BTU/ft3	2.8	
Net Heating Value (Water Saturated at 0.25636 psia)	BTU/ft3	2.5	
Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/lb	38.2	
Net Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/lb	34.4	
Compressibility Factor "Z" (60 F, 14.696 psia)		0.9997	



Page 1 of 1

Client: Aquaterra Environmental Solutions, Inc.

Client Sample ID: CW-1 CAS Project ID: P1102313 Client Project ID: 2011 Cottonwood RDF Flare CAS Sample ID: P1102313-001

Test Code: EPA Method 3C Modified Date Collected: 6/7/11 HP5890 II/GC1/TCD Instrument ID: Date Received: 6/20/11 Analyst: Dante Munoz-Castaneda Date Analyzed: 6/29/11

Volume(s) Analyzed: Sampling Media: 1.0 L Summa Canister $0.10 \, \text{ml(s)}$

Test Notes:

Container ID: 1SC00246

> Initial Pressure (psig): Final Pressure (psig): 12.11 12.11

> > Canister Dilution Factor: 1.00

CAS#	Compound	Result	MRL	Data
		%, v/v	%, v/v	Qualifier
1333-74-0	Hydrogen	0.385	0.10	
7782-44-7	Oxygen +			
7440-37-1	Argon	1.32	0.10	
7727-37-9	Nitrogen	56.8	0.10	
630-08-0	Carbon Monoxide	ND	0.10	
74-82-8	Methane	24.3	0.10	
124-38-9	Carbon Dioxide	17.2	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.



Page 1 of 1

Client: Aquaterra Environmental Solutions, Inc.

Client Sample ID: CW-2 CAS Project ID: P1102313 Client Project ID: 2011 Cottonwood RDF Flare CAS Sample ID: P1102313-002

Test Code: EPA Method 3C Modified Date Collected: 6/7/11 HP5890 II/GC1/TCD Instrument ID: Date Received: 6/20/11 Analyst: Dante Munoz-Castaneda Date Analyzed: 6/29/11

Volume(s) Analyzed: Sampling Media: 1.0 L Summa Canister $0.10 \, \text{ml(s)}$

Test Notes:

Container ID: 1SC00063

> Initial Pressure (psig): Final Pressure (psig): 12.01 12.01

> > Canister Dilution Factor: 1.00

CAS#	Compound	Result	MRL	Data
		%, v/v	$\%$, $_{ m V/V}$	Qualifier
1333-74-0	Hydrogen	0.404	0.10	
7782-44-7	Oxygen +			
7440-37-1	Argon	0.269	0.10	
7727-37-9	Nitrogen	52.4	0.10	
630-08-0	Carbon Monoxide	ND	0.10	
74-82-8	Methane	27.4	0.10	
124-38-9	Carbon Dioxide	19.4	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.



Page 1 of 1

Client: Aquaterra Environmental Solutions, Inc.

Client Sample ID: CW-3 CAS Project ID: P1102313 Client Project ID: 2011 Cottonwood RDF Flare CAS Sample ID: P1102313-003

Test Code: EPA Method 3C Modified Date Collected: 6/7/11 HP5890 II/GC1/TCD Instrument ID: Date Received: 6/20/11 Analyst: Dante Munoz-Castaneda Date Analyzed: 6/29/11

Volume(s) Analyzed: Sampling Media: 1.0 L Summa Canister $0.10 \, \text{ml(s)}$

Test Notes:

Container ID: 1SC00774

> Initial Pressure (psig): Final Pressure (psig): 11.58 11.58

> > Canister Dilution Factor: 1.00

CAS#	Compound	Result	MRL	Data
		%, v/v	%, v/v	Qualifier
1333-74-0	Hydrogen	ND	0.10	
7782-44-7	Oxygen +			
7440-37-1	Argon	11.5	0.10	
7727-37-9	Nitrogen	88.0	0.10	
630-08-0	Carbon Monoxide	ND	0.10	
74-82-8	Methane	0.280	0.10	
124-38-9	Carbon Dioxide	0.222	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.



Page 1 of 1

Client: Aquaterra Environmental Solutions, Inc.

Client Sample ID: Method Blank CAS Project ID: P1102313 Client Project ID: 2011 Cottonwood RDF Flare CAS Sample ID: P110629-MB

Test Code: EPA Method 3C Modified Date Collected: NA HP5890 II/GC1/TCD Instrument ID: Date Received: NA Analyst: Dante Munoz-Castaneda Date Analyzed: 6/29/11

Sampling Media: Volume(s) Analyzed: 1.0 L Summa Canister $0.10 \, \text{ml(s)}$

Test Notes:

CAS#	Compound	Result	MRL	Data
		%, v/v	%, v/v	Qualifier
1333-74-0	Hydrogen	ND	0.10	
7782-44-7	Oxygen +			
7440-37-1	Argon	ND	0.10	
7727-37-9	Nitrogen	ND	0.10	
630-08-0	Carbon Monoxide	ND	0.10	
74-82-8	Methane	ND	0.10	
124-38-9	Carbon Dioxide	ND	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.



LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

Client: Aquaterra Environmental Solutions, Inc.

Client Sample ID: Lab Control Sample CAS Project ID: P1102313 Client Project ID: 2011 Cottonwood RDF Flare CAS Sample ID: P110629-LCS

Test Code: EPA Method 3C Modified Date Collected: NA Instrument ID: HP5890 II/GC1/TCD Date Received: NA Analyst: Dante Munoz-Castaneda Date Analyzed: 6/29/11

1.0 L Summa Canister Volume(s) Analyzed: Sampling Media: NA ml(s)

Test Notes:

					CAS	
CAS#	Compound	Spike Amount	Result	% Recovery	Acceptance	Data
		ppmV	ppmV		Limits	Qualifier
1333-74-0	Hydrogen	40,300	41,600	103	83-122	
7782-44-7	Oxygen +					
7440-37-1	Argon	50,000	50,000	100	74-132	
7727-37-9	Nitrogen	49,800	48,800	98	76-126	
630-08-0	Carbon Monoxide	49,900	54,000	108	84-113	
74-82-8	Methane	40,300	42,000	104	84-113	
124-38-9	Carbon Dioxide	50,000	51,700	103	87-117	



Page 1 of 1

Client: Aquaterra Environmental Solutions, Inc.

Client Project ID: 2011 Cottonwood RDF Flare CAS Project ID: P1102313

Total Gaseous Nonmethane Organics (TGNMO) as Methane

Test Code:

EPA Method 25C Modified

Instrument ID: Analyst:

HP5890 II/GC1/FID/TCA Dante Munoz-Castaneda 1.0 L Summa Canister(s)

Date(s) Collected: 6/7/11

Date Received: 6/20/11 Date Analyzed: 6/24/11

Sampling Media: Test Notes:

Client Sample ID	CAS Sample ID	Canister Dilution Factor	Injection Volume ml(s)	Result ppmV	MRL ppmV	Data Qualifier
CW-1	P1102313-001	1.00	0.50	3,100	1.0	
CW-2	P1102313-002	1.00	0.50	3,700	1.0	
CW-3	P1102313-003	1.00	0.50	36	1.0	
Method Blank	P110624-MB	1.00	0.50	ND	1.0	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.



LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

Client: Aquaterra Environmental Solutions, Inc.

Client Sample ID: Lab Control Sample CAS Project ID: P1102313 Client Project ID: 2011 Cottonwood RDF Flare CAS Sample ID: P110624-LCS

EPA Method 25C Modified Test Code: Date Collected: NA Instrument ID: HP5890 II/GC1/FID/TCA Date Received: NA Analyst: Dante Munoz-Castaneda Date Analyzed: 6/24/11

Sampling Media: 1.0 L Summa Canister Volume(s) Analyzed: NA ml(s)

Test Notes:

				CAS	
Compound	Spike Amount	Result	% Recovery	Acceptance	Data
	ppmV	ppmV		Limits	Qualifier
Total Gaseous Nonmethane Organics (TGNMO) as Methane	98.8	97.7	99	71-136	



LABORATORY REPORT

November 14, 2011

Andy Limmer, P.G. Aguaterra Environmental Solutions, Inc. 13 Executive Drive, Suite 1 Fairview Heights, IL 62208

RE: Cottonwood Hills 2011 Gas / 4733.10

Dear Andy:

Enclosed are the results of the samples submitted to our laboratory on November 1, 2011. For your reference, these analyses have been assigned our service request number P1104227.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAPaccredited analytes, refer to the certifications section at www.caslab.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

Columbia Analytical Services, Inc. is certified by the California Department of Health Services, NELAP Laboratory Certificate No. 02115CA; Arizona Department of Health Services, Certificate No. AZ0694; Florida Department of Health, NELAP Certification E871020; New Jersey Department of Environmental Protection, NELAP Laboratory Certification ID #CA009; New York State Department of Health, NELAP NY Lab ID No: 11221; Oregon Environmental Laboratory Accreditation Program, NELAP ID: CA20007; The American Industrial Hygiene Association, Laboratory #101661; United States Department of Defense Environmental Laboratory Accreditation Program (DoD-ELAP), Certificate No. L10-3-R2; Pennsylvania Registration No. 68-03307; TX Commission of Environmental Quality, NELAP ID T104704413-11-2; Minnesota Department of Health, NELAP Certificate No. 219474; Washington State Department of Ecology, ELAP Lab ID: C946. Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact me for information corresponding to a particular certification.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

Columbia Analytical Services, Inc.

Sue Anderson Project Manager



Client: Aquaterra Environmental Solutions, Inc. CAS Project No: P1104227

Cottonwood Hills 2011 Gas / 4733.10 Project:

CASE NARRATIVE

The samples were received intact under chain of custody on November 1, 2011 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

BTU and CHONS Analysis

The results for BTU and CHONS were generated according to ASTM D 3588-98. The following analyses were performed and used to calculate the BTU and CHONS results.

C2 through C6 Hydrocarbon Analysis

The samples were analyzed according to modified EPA Method TO-3 for C_2 through $>C_6$ hydrocarbons using a gas chromatograph equipped with a flame ionization detector (FID).

Fixed Gases Analysis

The samples were also analyzed for fixed gases (hydrogen, oxygen/argon, nitrogen, carbon monoxide, methane and carbon dioxide) according to ASTM D 1946 using a gas chromatograph equipped with a thermal conductivity detector (TCD).

Hydrogen Sulfide Analysis

The were also analyzed for hydrogen sulfide per ASTM D 5504-08 using a gas chromatograph equipped with a sulfur chemiluminescence detector (SCD).

Total Gaseous Non-Methane Organics as Methane Analysis

The samples were also analyzed for total gaseous non-methane organics as methane according to modified EPA The analyses included a single sample injection (method modification) analyzed by gas chromatography using flame ionization detection/total combustion analysis.

The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for utilization of less than the complete report.

Use of Columbia Analytical Services, Inc. (CAS) Name. Client shall not use CAS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to CAS any test result, tolerance or specification derived from CAS's data ("Attribution") without CAS's prior written consent, which may be withheld by CAS for any reason in its sole discretion. To request CAS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If CAS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use CAS's name or trademark in any Materials or Attribution shall be deemed denied. CAS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of CAS's name or trademark may cause CAS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.



DETAIL SUMMARY REPORT

Container

ID

1SC00198

1SC00067

1SC00803

Pi1

(psig)

-1.94

-2.76

-2.17

Pf1

(psig)

5.44

5.19

5.20

Client: Aquaterra Environmental Solutions, Inc.

Lab Code

P1104227-001

P1104227-002

P1104227-003

Project ID:

Cottonwood Hills 2011 Gas / 4733.10

Matrix

Air

Air

Air

Date

Collected

10/26/2011

10/26/2011

10/26/2011

Time

Collected

11:45

12:25

12:50

Date Received: Time Received:

Client Sample ID

CW-4

CW-5

CW-6

11/1/2011 09:30

Service Request: P1104227

X TO-3 Modified - C1C X 3C Modified - Fxd Gas X ASTM D5504-01 - H: X 25C Modified - TGNMO+
X - X - X - X
X - X - X - X

X X

X

P1104227_Detail Summary_1111111553_RB.xls - DETAIL SUMMARY



Air - Chain of Custody Record & Analytical Service Request

	1)
Page		of	<u></u>

2655 Park Center Drive, Suite A Simi Valley, California 93065

Phone (805) 526-7161				Requested Turnaro	und Time in Busin	ess Days (Surc	harges) please	circle		CAS Project	No _r 277
Fax (805) 526-7270				1 Day (100%) 2 Day	(75%) 3 Day (50%) 4 Day (35%)	5 Day (25%) 10	Day-Stand	iard CAS Contac	1 116	14-CC 1
Company Name & Address (Reporting		o losting	Š	Project Name Cotto-was Project Number	d H:115	2011 6	AS			s Method	
Project Manager Andly Lin	mer			P.O. # / Billing Inform					326	TOTAL WAS EST YSS	Comments
618 624 2001			1000 (A)	Sampler (Print & Sign)					2000 COL	12 / C	e.g. Actual Preservative or specific instructions
email Address for Result Reporting	ere lav.	() · ~			3 Sorda	~			li s	5 \$	
Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Canister ID (Bar code # - AC, SC, etc.)	Flow Controller ID (Bar code #- FC #)	Canister Start Pressure "Hg	Canister End Pressure "Hg/psig	Sample Volume	Henting Astm D	interi S	
CW-4		10/26	1145	1500 198	P6101709	-22	-3.5		K	۶	
CW-5		19/26	1225	1500067	MG01652	-28	-5		k .	×	
CW-6		19/26	1250	15C 00803	AUG01678	~25.5	-5		k	K	
					!						
							Mary Mary Mary Mary Mary Mary Mary Mary	The state of the s			
·											
LAMA .											
Report Tier Levels - please select Tier I - Results (Default if not specified) _ Tier II (Results + QC Summaries)			•	ts + QC & Calibration Sur Validation Package) 10%	·	<u></u>		EDD requ	uired Yes /		Project Requirements (MRLs, QAPP)
Relinquished by: (Signature)	A		Date:	Time: / 44 0	Received by: (Signar	iure)			Date: / /	Time: 930	
Relinquished by: (Signature)	[Date:	Time:	Received by: (Signal	Cyrlo - Styl			Daye:	Time:	Cooler / Blank Temperature°C



Sample Acceptance Check Form

		vironmental Solutions Hills 2011 Gas / 4733				Work order:	P1104227			
	s) received on:		7.10		Date opened:	11/1/11	by:	SSTAI	PLES	
-		samples received by CAS.	The use of this for	E .						
1 2 3 4 5 6	Were sample Container(s) s Did sample c Were chain-o Did sample c Was sample v Are samples v	containers properly supplied by CAS? ontainers arrive in go f-custody papers used ontainer labels and/ovolume received adequithin specified holdisemperature (thermal	pH will only be ever marked with clood condition? d and filled out or tags agree what for analysing times?	aluated either at the ient sample IE ? ith custody papies?	ne request of the O? pers?	client and/or as require			No	<u>N/A</u>
9	Was a trin bl	ank received?							X	
10		seals on outside of c	ooler/Box?						\boxtimes	
11	Were signature Were seals into Were custody Were signature Were seals into Do containe Is there a clie Were <u>VOA v</u>	Location of seal(s)? re and date included? react? seals on outside of seal(s)? re and date included?	reservation, as submitted same ence/absence of that the analy oped and intact moisture?	r? ccording to me ples are pH pf air bubbles? vst check the save the sa	ethod/SOP or reserved? ample pH and	Client specified i		00000000000000000		
Lab S	Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	·-	ot / Pres	ervation	
1104227	-001.01	1.0 L Source Can	PII	pii	pii	(Tresence/Trosence)				
$\frac{1104227}{1104227}$		1.0 L Source Can								
1104227		1.0 L Source Can								
Explain	any discrepanc	ies: (include lab sample	ID numbers):							
Day 3	DEDD HOL (TYPE)	Day dog (W. C. O. C. C. C.	TT: A)							
		RSK - CO2, (pH 5-8); Sulfur (33.10.xls - Page 1 of 1 5 of 15				11/14/11	9:51 AM	

WM00575



Page 1 of 1

Client: Aquaterra Environmental Solutions, Inc.

Client Sample ID: CW-4 CAS Project ID: P1104227 Client Project ID: Cottonwood Hills 2011 Gas / 4733.10 CAS Sample ID: P1104227-001

Test Code: ASTM D3588-98

Analyst: Dante Munoz-Castaneda/Lauryn Keeler Date Collected: 10/26/11 Sampling Media: 1.0 L Summa Canister Date Received: 11/1/11

Test Notes:

Container ID: 1SC00198

> Initial Pressure (psig): -1.94 Final Pressure (psig): 5.44

		Canister Dilution Factor: 1.58		
Components	Result	Result	Data	
	Volume %	Weight %	Qualifier	
Hydrogen	0.74	0.05		
Oxygen + Argon	1.69	1.94		
Nitrogen	12.12	12.21		
Carbon Monoxide	< 0.01	< 0.01		
Methane	49.41	28.51		
Carbon Dioxide	35.92	56.88		
Hydrogen Sulfide	< 0.01	< 0.01		
Ethane	< 0.01	< 0.01		
Propane	< 0.01	< 0.01		
Butanes	< 0.01	< 0.01		
Pentanes	< 0.01	0.03		
Hexanes	0.01	0.03		
> Hexanes	0.08	0.31		
TOTALS	99.99	99.99		

Components	Mole %	Weight %	
Carbon	22.26	37.17	
Hydrogen	52.00	7.29	
Oxygen + Argon	19.47	43.32	
Nitrogen	6.28	12.22	
Sulfur	< 0.10	< 0.10	

Specific Gravity (Air = 1)		0.9597	
Specific Volume	ft3/lb	13.65	
Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/ft3	508.8	
Net Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/ft3	458.1	
Gross Heating Value (Water Saturated at 0.25636 psia)	BTU/ft3	498.6	
Net Heating Value (Water Saturated at 0.25636 psia)	BTU/ft3	448.9	
Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/lb	6,946.4	
Net Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/lb	6,254.8	
Compressibility Factor "Z" (60 F, 14.696 psia)		0.9973	



Page 1 of 1

Client: Aquaterra Environmental Solutions, Inc.

Client Sample ID: CW-5 CAS Project ID: P1104227 Client Project ID: Cottonwood Hills 2011 Gas / 4733.10 CAS Sample ID: P1104227-002

Test Code: ASTM D3588-98

Analyst: Dante Munoz-Castaneda/Lauryn Keeler Date Collected: 10/26/11 Sampling Media: 1.0 L Summa Canister Date Received: 11/1/11

Test Notes:

Container ID: 1SC00067

> Initial Pressure (psig): -2.76 Final Pressure (psig): 5.19

		Canister Dilution Factor: 1.67			
Components	Result	Result	Data		
	Volume %	Weight %	Qualifier		
Hydrogen	0.72	0.05			
Oxygen + Argon	1.76	2.03			
Nitrogen	12.27	12.34			
Carbon Monoxide	< 0.01	< 0.01			
Methane	49.25	28.37			
Carbon Dioxide	35.83	56.62			
Hydrogen Sulfide	< 0.01	< 0.01			
Ethane	< 0.01	< 0.01			
Propane	< 0.01	< 0.01			
Butanes	< 0.01	< 0.01			
Pentanes	< 0.01	0.03			
Hexanes	0.01	0.03			
> Hexanes	0.12	0.49			
TOTALS	99.99	99.99			
Components	Mole %	Weight %			
Carbon	22.25	37.15			
Hydrogen	51.96	7.28			
Oxygen + Argon	19.44	43.22			
Nitrogen	6.34	12.35			
Sulfur	< 0.10	< 0.10			
Specific Gravity (Air = 1)		0.9614			
Specific Volume	ft3/lb	13.63			
Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/ft3	509.9			
Net Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/ft3	459.2			
Gross Heating Value (Water Saturated at 0.25636 psia)	BTU/ft3	499.6			
Net Heating Value (Water Saturated at 0.25636 psia)	BTU/ft3	450.0		450.0	
Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/lb	6,949.1			

Net Heating Value (Dry Gas @ 60 F, 14.696 psia)

Compressibility Factor "Z" (60 F, 14.696 psia)

6,258.3

0.9973

BTU/lb



Page 1 of 1

Client: Aquaterra Environmental Solutions, Inc.

Client Sample ID: CW-6 CAS Project ID: P1104227 Client Project ID: Cottonwood Hills 2011 Gas / 4733.10 CAS Sample ID: P1104227-003

Test Code: ASTM D3588-98

Analyst: Dante Munoz-Castaneda/Lauryn Keeler Date Collected: 10/26/11 Sampling Media: 1.0 L Summa Canister Date Received: 11/1/11

Test Notes:

Container ID: 1SC00803

> Initial Pressure (psig): -2.17 Final Pressure (psig): 5.20

		Canister Dilution Factor: 1.59		
Components	Result	Result	Data	
_	Volume %	Weight %	Qualifier	
Hydrogen	0.73	0.05		
Oxygen + Argon	1.96	2.26		
Nitrogen	12.93	13.00		
Carbon Monoxide	< 0.01	< 0.01		
Methane	48.72	28.04		
Carbon Dioxide	35.48	56.03		
Hydrogen Sulfide	< 0.01	< 0.01		
Ethane	< 0.01	< 0.01		
Propane	< 0.01	< 0.01		
Butanes	< 0.01	< 0.01		
Pentanes	0.01	0.03		
Hexanes	0.01	0.04		
> Hexanes	0.13	0.53		
TOTALS	99.99	99.99		
Components	Mole %	Weight %		
Carbon	22.14	36.77		
Hydrogen	51.70	7.20		
Oxygen + Argon	19.45	43.02		
Nitrogen	6.72	13.01		
Sulfur	< 0.10	< 0.10		

Sulfur	< 0.10	< 0.10	
Specific Gravity (Air = 1)		0.9623	
Specific Volume	ft3/lb	13.62	
Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/ft3	505.3	
Net Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/ft3	455.1	
Gross Heating Value (Water Saturated at 0.25636 psia)	BTU/ft3	495.1	
Net Heating Value (Water Saturated at 0.25636 psia)	BTU/ft3	445.9	
Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/lb	6,879.9	
Net Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/lb	6,196.3	
Compressibility Factor "Z" (60 F, 14.696 psia)		0.9973	



Page 1 of 1

Client: Aquaterra Environmental Solutions, Inc.

Client Sample ID: CW-4 CAS Project ID: P1104227 Client Project ID: Cottonwood Hills 2011 Gas / 4733.10 CAS Sample ID: P1104227-001

Test Code: EPA Method 3C Modified Date Collected: 10/26/11 HP5890 II/GC1/TCD Instrument ID: Date Received: 11/1/11 Analyst: Dante Munoz-Castaneda Date Analyzed: 11/3/11

Sampling Media: Volume(s) Analyzed: 1.0 L Summa Canister $0.10 \, \text{ml(s)}$

Test Notes:

Container ID: 1SC00198

> Initial Pressure (psig): Final Pressure (psig): 5.44 -1.94

> > Canister Dilution Factor: 1.58

CAS#	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
1222 74 0	TT			Quanner
1333-74-0	Hydrogen	0.741	0.16	
7782-44-7	Oxygen +			
7440-37-1	Argon	1.69	0.16	
7727-37-9	Nitrogen	12.1	0.16	
630-08-0	Carbon Monoxide	ND	0.16	
74-82-8	Methane	49.4	0.16	
124-38-9	Carbon Dioxide	35.9	0.16	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.



Page 1 of 1

Client: Aquaterra Environmental Solutions, Inc.

Client Sample ID: CW-5 CAS Project ID: P1104227 Client Project ID: Cottonwood Hills 2011 Gas / 4733.10 CAS Sample ID: P1104227-002

Test Code: EPA Method 3C Modified Date Collected: 10/26/11 HP5890 II/GC1/TCD Instrument ID: Date Received: 11/1/11 Analyst: Dante Munoz-Castaneda Date Analyzed: 11/3/11

Sampling Media: Volume(s) Analyzed: 1.0 L Summa Canister $0.10 \, \text{ml(s)}$

Test Notes:

Container ID: 1SC00067

> Initial Pressure (psig): Final Pressure (psig): 5.19 -2.76

> > Canister Dilution Factor: 1.67

CAS#	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
1333-74-0	Hydrogen	0.721	0.17	Quantier
7782-44-7	Oxygen +			
7440-37-1	Argon	1.76	0.17	
7727-37-9	Nitrogen	12.3	0.17	
630-08-0	Carbon Monoxide	ND	0.17	
74-82-8	Methane	49.3	0.17	
124-38-9	Carbon Dioxide	35.8	0.17	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.



Page 1 of 1

Client: Aquaterra Environmental Solutions, Inc.

Client Sample ID: CW-6 CAS Project ID: P1104227 Client Project ID: Cottonwood Hills 2011 Gas / 4733.10 CAS Sample ID: P1104227-003

Test Code: EPA Method 3C Modified Date Collected: 10/26/11 HP5890 II/GC1/TCD Instrument ID: Date Received: 11/1/11 Analyst: Dante Munoz-Castaneda Date Analyzed: 11/3/11

Sampling Media: Volume(s) Analyzed: 1.0 L Summa Canister $0.10 \, \text{ml(s)}$

Test Notes:

Container ID: 1SC00803

> Initial Pressure (psig): Final Pressure (psig): 5.20 -2.17

> > Canister Dilution Factor: 1.59

CAS#	Compound	Result	MRL	Data
		%, v/v	%, V/V	Qualifier
1333-74-0	Hydrogen	0.726	0.16	
7782-44-7	Oxygen +			
7440-37-1	Argon	1.96	0.16	
7727-37-9	Nitrogen	12.9	0.16	
630-08-0	Carbon Monoxide	ND	0.16	
74-82-8	Methane	48.7	0.16	
124-38-9	Carbon Dioxide	35.5	0.16	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.



Page 1 of 1

Client: Aquaterra Environmental Solutions, Inc.

Client Sample ID: Method Blank CAS Project ID: P1104227 Client Project ID: Cottonwood Hills 2011 Gas / 4733.10 CAS Sample ID: P111103-MB

Test Code: EPA Method 3C Modified Date Collected: NA HP5890 II/GC1/TCD Instrument ID: Date Received: NA Analyst: Dante Munoz-Castaneda Date Analyzed: 11/03/11

Sampling Media: Volume(s) Analyzed: 1.0 L Summa Canister $0.10 \, \text{ml(s)}$

Test Notes:

CAS#	Compound	Result	MRL	Data
		%, v/v	$\%$, $_{ m V/V}$	Qualifier
1333-74-0	Hydrogen	NI	0.10	
7782-44-7	Oxygen +			
7440-37-1	Argon	NI	0.10	
7727-37-9	Nitrogen	NI	0.10	
630-08-0	Carbon Monoxide	NI	0.10	
74-82-8	Methane	NI	0.10	
124-38-9	Carbon Dioxide	NI	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.



LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

Client: Aquaterra Environmental Solutions, Inc.

Client Sample ID: Lab Control Sample CAS Project ID: P1104227 Client Project ID: Cottonwood Hills 2011 Gas / 4733.10 CAS Sample ID: P111103-LCS

Test Code: EPA Method 3C Modified Date Collected: NA Instrument ID: HP5890 II/GC1/TCD Date Received: NA Analyst: Dante Munoz-Castaneda Date Analyzed: 11/03/11

1.0 L Summa Canister Volume(s) Analyzed: Sampling Media: NA ml(s)

Test Notes:

CAS#	Compound	Spike Amount ppmV	Result ppmV	% Recovery	CAS Acceptance Limits	Data Qualifier
1333-74-0	Hydrogen	40,300	44,200	110	83-122	
7782-44-7	Oxygen +					
7440-37-1	Argon	50,000	51,600	103	74-132	
7727-37-9	Nitrogen	49,800	50,100	101	76-126	
630-08-0	Carbon Monoxide	49,900	55,000	110	84-113	
74-82-8	Methane	40,300	43,500	108	84-113	
124-38-9	Carbon Dioxide	50,000	53,800	108	87-117	



Page 1 of 1

Client: Aquaterra Environmental Solutions, Inc.

Client Project ID: Cottonwood Hills 2011 Gas / 4733.10 CAS Project ID: P1104227

Total Gaseous Nonmethane Organics (TGNMO) as Methane

Test Code:

EPA Method 25C Modified

Instrument ID: Analyst:

HP5890 II/GC1/FID/TCA Dante Munoz-Castaneda 1.0 L Summa Canister(s)

Date(s) Collected: 10/26/11

Date Received: 11/1/11 Date Analyzed: 11/4/11

Sampling Media: Test Notes:

Client Sample ID	CAS Sample ID	Canister Dilution Factor	Injection Volume ml(s)	Result ppmV	MRL ppmV	Data Qualifier
CW-4	P1104227-001	1.58	0.50	5,500	1.6	
CW-5	P1104227-002	1.67	0.50	5,800	1.7	
CW-6	P1104227-003	1.59	0.50	6,100	1.6	
Method Blank	P111104-MB	1.00	0.50	ND	1.0	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.



LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

Client: Aquaterra Environmental Solutions, Inc.

Client Sample ID: Lab Control Sample CAS Project ID: P1104227 Client Project ID: Cottonwood Hills 2011 Gas / 4733.10 CAS Sample ID: P111104-LCS

Test Code: EPA Method 25C Modified Date Collected: NA Instrument ID: HP5890 II/GC1/FID/TCA Date Received: NA Analyst: Dante Munoz-Castaneda Date Analyzed: 11/04/11

Sampling Media: 1.0 L Summa Canister Volume(s) Analyzed: NA ml(s)

Test Notes:

				CAS	
Compound	Spike Amount	Result	% Recovery	Acceptance	Data
	ppmV	ppmV		Limits	Qualifier
Total Gaseous Nonmethane Organics (TGNMO) as Methane	98.8	98.3	99	71-136	



LABORATORY REPORT

June 21, 2011

Randolph Homburg Aguaterra Environmental Solutions, Inc. 13 Executive Dr., Suite 1 Fairview Heights, IL 62208

RE: Cottonwood Hills RDF Flare Sampling / 2011 Cottonwood Hills Gas Testing

Dear Randolph:

Enclosed are the results of the samples submitted to our laboratory on June 8, 2011. For your reference, these analyses have been assigned our service request number P1102140.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAPaccredited analytes, refer to the certifications section at www.caslab.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

Columbia Analytical Services, Inc. is certified by the California Department of Health Services, NELAP Laboratory Certificate No. 02115CA; Arizona Department of Health Services, Certificate No. AZ0694; Florida Department of Health, NELAP Certification E871020; New Jersey Department of Environmental Protection, NELAP Laboratory Certification ID #CA009; New York State Department of Health, NELAP NY Lab ID No: 11221; Oregon Environmental Laboratory Accreditation Program, NELAP ID: CA20007; The American Industrial Hygiene Association, Laboratory #101661; United States Department of Defense Environmental Laboratory Accreditation Program (DoD-ELAP), Certificate No. L10-3-R1; Pennsylvania Registration No. 68-03307; TX Commission of Environmental Quality, NELAP ID T104704413-10-1; Minnesota Department of Health, NELAP Certificate No. 219474; Washington State Department of Ecology, ELAP Lab ID: C946. Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact me for information corresponding to a particular certification.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

Columbia Analytical Services, Inc.

Sue Anderson Project Manager



Client: Aquaterra Environmental Solutions, Inc. CAS Project No: P1102140

Cottonwood Hills RDF Flare Sampling / 2011 Cottonwood Hills Gas Testing Project:

CASE NARRATIVE

The samples were received intact under chain of custody on June 8, 2011 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

Sulfur Analysis

The samples were analyzed for twenty sulfur compounds per ASTM D 5504-08 using a gas chromatograph equipped with a sulfur chemiluminescence detector (SCD). All compounds with the exception of hydrogen sulfide and carbonyl sulfide are quantitated against the initial calibration curve for methyl mercaptan.

The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for utilization of less than the complete report.

Use of Columbia Analytical Services, Inc. (CAS) Name. Client shall not use CAS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to CAS any test result, tolerance or specification derived from CAS's data ("Attribution") without CAS's prior written consent, which may be withheld by CAS for any reason in its sole discretion. To request CAS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If CAS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client. Client's request to use CAS's name or trademark in any Materials or Attribution shall be deemed denied. CAS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of CAS's name or trademark may cause CAS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.



DETAIL SUMMARY REPORT Client: Aquaterra Environmental Solutions, Inc. Service Request: P1102140 Project ID: Cottonwood Hills RDF Flare Sampling / 2011 Cottonwood Hills Gas Testing 5504-01 - Sulfur Bag Date Received: 6/8/2011 Time Received: 09:40

			Date	Time	U MT
Client Sample ID	Lab Code	Matrix	Collected	Collected	VS
CW-1	P1102140-001	Air	6/7/2011	14:22	X
CW-2	P1102140-002	Air	6/7/2011	14:24	X
CW-3	P1102140-003	Air	6/7/2011	14:26	X



Air - Chain of Custody Record & Analytical Service Request

Page	of	
		 ·

2655 Park Center Drive, Suite A Simi Valley, California 93065 Phone (805) 526-7161 Fax (805) 526-7270

Phone (805) 526-7161		Requested Turnarou						CAS Project	NO. - O 2140
Fax (805) 526-7270		1 Day (100%) 2 Day	(75%) 3 Day (50%	6) 4 Day (35%) 5	5 Day (25%)(10	Day-Stand	dard ICAS Contact		0440
Company Name & Address (Reporting Information) Agua Terra Unvironmental 13 Executive Dr. Svite 1 Fairview Heights, Il 62208 Project Manager Randolph Homburg Phone 6/8 628 2001 6/8 628		Project Name Project Number Z 0 // (+) + e	Hills RI	DF Flore GAS	Sampl Testing			s Method	
Randolph Homburg	···········	P.O. # / Billing Inform	аноп				1 .		Comments
6/8 628 Zool 6/8 628	200 Z		······	·····	· · · · · · · · · · · · · · · · · · ·		= = =		e.g. Actual Preservative or specific instructions
Email Address for Result Reporting Rhombury @ aquaterra -env. com		Sampler (Print & Sign) Bob Hill	/ Collin	Curson			1		
Client Sample ID Laboratory Date ID Number Collected	Time Collected	Canister ID (Bar code # - AC, SC, etc.)	Flow Controller ID (Bar code #- FC #)	Canister Start Pressure "Hg	Canister End Pressure "Hg/psig	Sample Volume	AST Total		
CW-1 (1) 6/7/11	1422	90678-41296		Salar-		.5L			
CW-1 (1) 6/7/11 CW-2 (2) 6/7/11	1424	90675-41301				·5L			
CW-3 8 6/7/11/	426	90675-41299				·5C			
							·		
							The state of the s		
				The state of the s					
		,	- constitute transacte tuerre tueblecen e	The state of the s					

	,								
		s + QC & Calibration Sum /alidation Package) 10% 5	Surcharge			EDD requ	uired Yes /	€0	Project Requirements (MRLs, QAPP)
Relinquished by: (Signature)	Date: 1/11	Time:	Received by: (Sign	12700	00000	_	Uslu	Time:	
Relinquished by: (Signature)	Date:	Time:	Received by: (Signat	ure)			Date:	Time:	Cooler / Blank Temperature°C



Sample Acceptance Check Form

		rironmental Solutions,			E .		P1102140			
		Iills RDF Flare Sampl	ing / 2011 Co				1	3 (7 A 3	(OD 4	
	s) received on:		TI (4' C	•S	Date opened:			MZAN		
		samples received by CAS. Thermal preservation and p							cation of	
inpirance	or noncomorning.	Thermal preservation and p	iii wiii oiny be ev	atuated either at th	le request or the	enem and/or as require	ed by the method/k	Yes	<u>No</u>	<u>N/A</u>
1	Were sample	containers properly n	narked with cl	ient sample ID	?			X		
2	-	upplied by CAS?		•				X		
3	Did sample co		X							
4	Were chain-of-custody papers used and filled out?									
5		ontainer labels and/or			ners?			$\overline{\mathbf{x}}$		
6	_	olume received adequ						$\overline{\mathbf{x}}$		
7	-	vithin specified holding	-					×		
8	_	mperature (thermal p	_	of cooler at rec	eint adhered	to?				×
Ü		ooler Temperature	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		Temperature		°C	_		
9	Was a trip bla			, C Diam'r	emperature	J	. ~			X
10		seals on outside of co	oler/Box?						×	
~~	,,,,,,,	Location of seal(s)?					Sealing Lid?			×
	Were signatur	e and date included?								×
	Were seals int									×
		seals on outside of sa	mple containe	r?					×	
		Location of seal(s)?	_				Sealing Lid?			X
	Were signatur	e and date included?								X
	Were seals int									X
11		rs have appropriate pr	eservation, a	ecording to me	thod/SOP or	Client specified i	nformation?			X
		nt indication that the s		9		2 2p 22				×
		ials checked for prese								X
	-	t/method/SOP require			ample pH and	l if necessary alte	er it?			$\overline{\mathbf{x}}$
12	Tubes:	Are the tubes cap	_		impro pri uni	a <u>ir necessary</u> are				×
12	24000	Do they contain n		•						×
13	Badges:	Are the badges p		d and intact?						X
13	Dauges.	Are dual bed badg			v canned and	lintact?		$\overline{\Box}$		X
		Are dual bed badg	cs separated a	and marviduan	y capped and	i mact:				
Lab	Sample ID	Container	Required	Received	Adjusted	VOA Headspace			ervation	5
		Description	pH *	pН	pН	(Presence/Absence)		Commei	nts	
	0-001.01	1 L Zefon Bag								
	0-002.01 0-003.01	1 L Zefon Bag 1 L Zefon Bag								
1102140	7-003.01	1 L Zeloli Bag								
Explain	any discrepanci	es: (include lab sample l	ID numbers):							
RSK - MI	EEPP, HCL (pH<2); I	RSK - CO2, (pH 5-8); Sulfur (pl	H>4)							

Date Collected: 6/7/11

Time Collected: 14:22

Volume(s) Analyzed:

0.50 ml(s)



RESULTS OF ANALYSIS

Page 1 of 1

Client: Aquaterra Environmental Solutions, Inc. CAS Project ID: P1102140 Client Sample ID: CW-1 CAS Sample ID: P1102140-001

Client Project ID: Cottonwood Hills RDF Flare Sampling / 2011 Cottonwood Hills Gas Testing

Test Code: ASTM D 5504-08 Instrument ID: Agilent 7890A/GC22/SCD Analyst:

Wade Henton/Lauryn Keeler Date Received: 6/8/11

Sampling Media: 1 L Zefon Bag Date Analyzed: 6/8/11 Test Notes: Time Analyzed: 11:08

CAS#	Compound	Result	MRL	Result	MRL	Data
		$\mu g/m^3$	μg/m³	ppbV	ppbV	Qualifier
7783-06-4	Hydrogen Sulfide	39,000	14	28,000	10	
463-58-1	Carbonyl Sulfide	240	25	97	10	
74-93-1	Methyl Mercaptan	11,000	20	5,700	10	
75-08-1	Ethyl Mercaptan	350	25	140	10	
75-18-3	Dimethyl Sulfide	32,000	25	13,000	10	
75-15-0	Carbon Disulfide	170	16	53	5.0	
75-33-2	Isopropyl Mercaptan	1,200	31	380	10	
75-66-1	tert-Butyl Mercaptan	2,400	37	650	10	
107-03-9	n-Propyl Mercaptan	170	31	54	10	
624-89-5	Ethyl Methyl Sulfide	340	31	110	10	
110-02-1	Thiophene	1,500	34	430	10	
513-44-0	Isobutyl Mercaptan	450	37	120	10	\mathbf{W}
352-93-2	Diethyl Sulfide	67	37	18	10	
109-79-5	n-Butyl Mercaptan	230	37	63	10	
624-92-0	Dimethyl Disulfide	51	19	13	5.0	
616-44-4	3-Methylthiophene	400	40	98	10	
110-01-0	Tetrahydrothiophene	69	36	19	10	
638-02-8	2,5-Dimethylthiophene	ND	46	ND	10	
872-55-9	2-Ethylthiophene	48	46	10	10	
110-81-6	Diethyl Disulfide	ND	25	ND	5.0	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.



Page 1 of 1

Client: Aquaterra Environmental Solutions, Inc. CAS Project ID: P1102140 Client Sample ID: CW-2 CAS Sample ID: P1102140-002

Client Project ID: Cottonwood Hills RDF Flare Sampling / 2011 Cottonwood Hills Gas Testing

Test Code: ASTM D 5504-08

Instrument ID: Agilent 7890A/GC22/SCD Analyst: Wade Henton/Lauryn Keeler

Sampling Media: 1 L Zefon Bag

Test Notes:

Date Collected: 6/7/11 Time Collected: 14:24 Date Received: 6/8/11 Date Analyzed: 6/8/11 Time Analyzed: 11:43

Volume(s) Analyzed: 0.50 ml(s)

CAS#	Compound	Result	MRL	Result	MRL	Data
		μg/m³	μg/m³	ppbV	ppbV	Qualifier
7783-06-4	Hydrogen Sulfide	42,000	14	30,000	10	
463-58-1	Carbonyl Sulfide	250	25	100	10	
74-93-1	Methyl Mercaptan	12,000	20	5,900	10	
75-08-1	Ethyl Mercaptan	370	25	150	10	
75-18-3	Dimethyl Sulfide	34,000	25	13,000	10	
75-15-0	Carbon Disulfide	180	16	58	5.0	
75-33-2	Isopropyl Mercaptan	1,300	31	400	10	
75-66-1	tert-Butyl Mercaptan	2,400	37	660	10	
107-03-9	n-Propyl Mercaptan	180	31	57	10	
624-89-5	Ethyl Methyl Sulfide	360	31	120	10	
110-02-1	Thiophene	1,500	34	450	10	
513-44-0	Isobutyl Mercaptan	440	37	120	10	\mathbf{W}
352-93-2	Diethyl Sulfide	74	37	20	10	
109-79-5	n-Butyl Mercaptan	240	37	64	10	
624-92-0	Dimethyl Disulfide	44	19	12	5.0	
616-44-4	3-Methylthiophene	410	40	100	10	
110-01-0	Tetrahydrothiophene	69	36	19	10	
638-02-8	2,5-Dimethylthiophene	ND	46	ND	10	
872-55-9	2-Ethylthiophene	50	46	11	10	
110-81-6	Diethyl Disulfide	ND	25	ND	5.0	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.



Page 1 of 1

Client: Aquaterra Environmental Solutions, Inc. CAS Project ID: P1102140 Client Sample ID: CW-3 CAS Sample ID: P1102140-003

Client Project ID: Cottonwood Hills RDF Flare Sampling / 2011 Cottonwood Hills Gas Testing

Test Code: ASTM D 5504-08

Instrument ID: Agilent 7890A/GC22/SCD Analyst: Wade Henton/Lauryn Keeler

Sampling Media: 1 L Zefon Bag

Test Notes:

Date Collected: 6/7/11 Time Collected: 14:26 Date Received: 6/8/11 Date Analyzed: 6/8/11

Time Analyzed: 12:26

Volume(s) Analyzed: 0.50 ml(s)

CAS#	Compound	Result	MRL	Result	MRL	Data
		$\mu g/m^3$	μg/m³	ppbV	ppbV	Qualifier
7783-06-4	Hydrogen Sulfide	36,000	14	26,000	10	
463-58-1	Carbonyl Sulfide	210	25	85	10	
74-93-1	Methyl Mercaptan	10,000	20	5,100	10	
75-08-1	Ethyl Mercaptan	300	25	120	10	
75-18-3	Dimethyl Sulfide	29,000	25	11,000	10	
75-15-0	Carbon Disulfide	140	16	46	5.0	*
75-33-2	Isopropyl Mercaptan	1,100	31	340	10	
75-66-1	tert-Butyl Mercaptan	2,000	37	550	10	
107-03-9	n-Propyl Mercaptan	130	31	43	10	
624-89-5	Ethyl Methyl Sulfide	300	31	96	10	
110-02-1	Thiophene	1,300	34	380	10	
513-44-0	Isobutyl Mercaptan	370	37	100	10	\mathbf{W}
352-93-2	Diethyl Sulfide	51	37	14	10	
109-79-5	n-Butyl Mercaptan	180	37	48	10	
624-92-0	Dimethyl Disulfide	38	19	10	5.0	
616-44-4	3-Methylthiophene	350	40	87	10	
110-01-0	Tetrahydrothiophene	58	36	16	10	
638-02-8	2,5-Dimethylthiophene	ND	46	ND	10	
872-55-9	2-Ethylthiophene	ND	46	ND	10	
110-81-6	Diethyl Disulfide	ND	25	ND	5.0	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.



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Client: Aquaterra Environmental Solutions, Inc. CAS Project ID: P1102140 Client Sample ID: Method Blank CAS Sample ID: P110608-MB

Client Project ID: Cottonwood Hills RDF Flare Sampling / 2011 Cottonwood Hills Gas Testing

Test Code: ASTM D 5504-08

Instrument ID: Agilent 7890A/GC22/SCD Analyst: Wade Henton/Lauryn Keeler

Sampling Media: 1 L Zefon Bag

Test Notes:

Date Collected: NA Time Collected: NA Date Received: NA Date Analyzed: 6/08/11

> Volume(s) Analyzed: 1.0 ml(s)

Time Analyzed: 09:22

CAS#	Compound	Result	MRL	Result	MRL	Data
		$\mu \mathrm{g}/\mathrm{m}^3$	$\mu g/m^3$	ppbV	ppbV	Qualifier
7783-06-4	Hydrogen Sulfide	ND	7.0	ND	5.0	
463-58-1	Carbonyl Sulfide	ND	12	ND	5.0	
74-93-1	Methyl Mercaptan	ND	9.8	ND	5.0	
75-08-1	Ethyl Mercaptan	ND	13	ND	5.0	
75-18-3	Dimethyl Sulfide	ND	13	ND	5.0	
75-15-0	Carbon Disulfide	ND	7.8	ND	2.5	
75-33-2	Isopropyl Mercaptan	ND	16	ND	5.0	
75-66-1	tert-Butyl Mercaptan	ND	18	ND	5.0	
107-03-9	n-Propyl Mercaptan	ND	16	ND	5.0	
624-89-5	Ethyl Methyl Sulfide	ND	16	ND	5.0	
110-02-1	Thiophene	ND	17	ND	5.0	
513-44-0	Isobutyl Mercaptan	ND	18	ND	5.0	
352-93-2	Diethyl Sulfide	ND	18	ND	5.0	
109-79-5	n-Butyl Mercaptan	ND	18	ND	5.0	
624-92-0	Dimethyl Disulfide	ND	9.6	ND	2.5	
616-44-4	3-Methylthiophene	ND	20	ND	5.0	
110-01-0	Tetrahydrothiophene	ND	18	ND	5.0	
638-02-8	2,5-Dimethylthiophene	ND	23	ND	5.0	
872-55-9	2-Ethylthiophene	ND	23	ND	5.0	
110-81-6	Diethyl Disulfide	ND	12	ND	2.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

Date Collected: NA

Volume(s) Analyzed:

NA ml(s)



LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

Aquaterra Environmental Solutions, Inc. Client: CAS Project ID: P1102140 Client Sample ID: Lab Control Sample CAS Sample ID: P110608-LCS

Client Project ID: Cottonwood Hills RDF Flare Sampling / 2011 Cottonwood Hills Gas Testing

Test Code: ASTM D 5504-08 Agilent 7890A/GC22/SCD Instrument ID: Analyst:

Date Received: NA Wade Henton/Lauryn Keeler Date Analyzed: 6/08/11

Sampling Media: 1 L Zefon Bag Test Notes:

CAS#	Compound	Spike Amount ppbV	Result ppbV	% Recovery	CAS Acceptance Limits	Data Qualifier
7783-06-4	Hydrogen Sulfide	2,380	1,920	81	71-129	
463-58-1	Carbonyl Sulfide	2,470	2,780	113	66-120	
74-93-1	Methyl Mercaptan	2,360	2,550	108	59-136	



LABORATORY REPORT

November 22, 2011

Andy Limmer, P.G. Aguaterra Environmental Solutions, Inc. 13 Executive Drive, Suite 1 Fairview Heights, IL 62208

RE: CH RDF Flare Gas Sample / 4733.10

Dear Andy:

Enclosed are the results of the samples submitted to our laboratory on November 9, 2011. For your reference, these analyses have been assigned our service request number P1104362.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAPaccredited analytes, refer to the certifications section at www.caslab.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

Columbia Analytical Services, Inc. is certified by the California Department of Health Services, NELAP Laboratory Certificate No. 02115CA; Arizona Department of Health Services, Certificate No. AZ0694; Florida Department of Health, NELAP Certification E871020; New Jersey Department of Environmental Protection, NELAP Laboratory Certification ID #CA009; New York State Department of Health, NELAP NY Lab ID No: 11221; Oregon Environmental Laboratory Accreditation Program, NELAP ID: CA20007; The American Industrial Hygiene Association, Laboratory #101661; United States Department of Defense Environmental Laboratory Accreditation Program (DoD-ELAP), Certificate No. L10-3-R2; Pennsylvania Registration No. 68-03307; TX Commission of Environmental Quality, NELAP ID T104704413-11-2; Minnesota Department of Health, NELAP Certificate No. 219474; Washington State Department of Ecology, ELAP Lab ID: C946. Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact me for information corresponding to a particular certification.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

Columbia Analytical Services, Inc.

Sue Anderson Project Manager



Client: Aquaterra Environmental Solutions, Inc. CAS Project No: P1104362

Project: CH RDF Flare Gas Sample / 4733.10

CASE NARRATIVE

The samples were received intact under chain of custody on November 9, 2011 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

Sulfur Analysis

The samples were analyzed for twenty sulfur compounds per ASTM D 5504-08 using a gas chromatograph equipped with a sulfur chemiluminescence detector (SCD). All compounds with the exception of hydrogen sulfide and carbonyl sulfide are quantitated against the initial calibration curve for methyl mercaptan.

The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for utilization of less than the complete report.

Use of Columbia Analytical Services, Inc. (CAS) Name. Client shall not use CAS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to CAS any test result, tolerance or specification derived from CAS's data ("Attribution") without CAS's prior written consent, which may be withheld by CAS for any reason in its sole discretion. To request CAS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If CAS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use CAS's name or trademark in any Materials or Attribution shall be deemed denied. CAS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of CAS's name or trademark may cause CAS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.



DETAIL SUMMARY REPORT Client: Aquaterra Environmental Solutions, Inc. Service Request: P1104362 Project ID: CH RDF Flare Gas Sample / 4733.10 D5504-01 - Sulfur Bag Date Received: 11/9/2011 Time Received: 09:45

			Date	Time	X
Client Sample ID	Lab Code	Matrix	Collected	Collected	YS
CW-4	P1104362-001	Air	11/8/2011	16:15	X
CW-5	P1104362-002	Air	11/8/2011	16:20	X
CW-6	P1104362-003	Air	11/8/2011	16:25	X

Air - Chain of Custody Record & Analytical Service Request

Page _____ of ____

2655 Park Center Drive, Suite A Simi Valley, California 93065 Phone (805) 526-7370

Phone (805) 526-7161 Fax (805) 526-7270				Requested Turnaro	und Time in Busin (75%) 3 Day (50%	i ess Days (Surci 5) 4 Day (35%) 5	narges) please 5 Day (25%) 10	c ircle Day-Stand	ard	CAS Project	No.	200
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Aquattela Envilon 13 Executive Olive Failview Heights	Suite TL	62208		CH RDF F		MIE		e e e e e e e e e e e e e e e e e e e				
Project Manager Andy Lim.	M V Fax			P.O. # / Billing Inform	nation			g namo-representative delicités	3 1 2 3	2	Comments e.g. Actual	- Andrews Company Company Company
Phone (618)- 628-2001 Email Address for Result Reporting		8.3063		Sampler (Print & Sign)			7		a	24 COD (24 18%	Preservative or specific instructions	`
Alimmer @ aquas	Laboratory	V. com	Time	Canister ID (Bar code # -	Flow Controller ID (Bar code #-	Canister Start Pressure	Canister End Pressure	Sample	\$ 5	£		
Client Sample ID	ID Number	Collected	Collected 16 15	AC, SC, etc.) 40675-461H	FC #)	"Hg	"Hg/psig	Volume	<u>*</u>		Tribule 1/25	
CW-4 CW-5	0	11-9-11	1690	90675.46309	and the same of th				×			
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Report Tier Levels - please select Tier I - Results (Default if not specified) Tier II (Results + QC Summaries)	<u>K</u>			ts + QC & Calibration Su Validation Package) 10%				EDD requ	ired Yes	/ (No)	Project Requiremen (MRLs, QAPP)	ıts
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Relinquished by: (Signature)			Date:	Time:	Received by: (Signa	iture)			Date:	Time:	Cooler / Blank Temperature°	c



Sample Acceptance Check Form

		ironmental Solutions Gas Sample / 4733.				Work order:	P1104362			
Sample(s) rece					Date opened:	11/9/11	by:	MZAN	1ORA	
		amples received by CAS.	The use of this for	•6						
ompliance or nonco	onformity.	Thermal preservation and	pH will only be ev	aluated either at th	ne request of the			SOP. Yes	<u>No</u>	<u>N/A</u>
	_	containers properly 1	marked with c	nent sample il) (\boxtimes		
	Container(s) supplied by CAS? Did sample containers arrive in good condition?									
	Were chain-of-custody papers used and filled out?									
								\boxtimes		
	_	ontainer labels and/o			pers?			\boxtimes		
	_	olume received adeq	-	SIS?				\boxtimes		
	_	ithin specified holding	_	of analar at raa	aint adharad	+o?				\boxtimes
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		Location of seal(s)?					Sealing Lid?			$\overline{\times}$
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Were	custody	seals on outside of sa	_	r?					\boxtimes	
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		nt indication that the			reservea?					\boxtimes
		als checked for prese				no. No. and	16.720			\boxtimes
		t/method/SOP require	-		ample pH and	d if necessary alte	er it?			\boxtimes
12 Tubes	s:	Are the tubes cap	pped and intact	.?						X
		Do they contain i						П		X
13 Badge	es:	Are the badges p								×
		Are dual bed bad	ges separated	and individual	y capped and	l intact?				×
Lab Sample	e ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)		ot / Prese Comme	ervation nts	
1104362-001.0		1 L Zefon Bag								
1104362-002.0		1 L Zefon Bag								
1104362-003.0)1	1 L Zefon Bag								
Explain any di	screpanci	es: (include lab sample	ID numbers):							
RSK - MEEPP, HO	CL (pH<2); R	SK - CO2, (pH 5-8); Sulfur (1	ьH>4)							
P1104362_A	quaterra Envir	onmental Solutions, IncCH RDF	Flare Gas Sample _ 473	33.10.xls - Page 1 of 1 5 of 10				11/22/11	9:24 AM	



Page 1 of 1

Client: Aquaterra Environmental Solutions, Inc.

Client Sample ID: CW-4 CAS Project ID: P1104362 Client Project ID: CH RDF Flare Gas Sample / 4733.10 CAS Sample ID: P1104362-001

Test Code: ASTM D 5504-08

Instrument ID: Agilent 7890A/GC22/SCD

Analyst: Lauryn Keeler Sampling Media: 1 L Zefon Bag

Test Notes:

Date Collected: 11/8/11 Time Collected: 16:15

> Date Received: 11/9/11 Date Analyzed: 11/9/11

Time Analyzed: 12:39

Volume(s) Analyzed: 1.0 ml(s)

CAS#	Compound	Result	MRL	Result	MRL	Data
		μg/m³	$\mu g/m^3$	ppbV	ppbV	Qualifier
7783-06-4	Hydrogen Sulfide	27,000	7.0	20,000	5.0	
463-58-1	Carbonyl Sulfide	300	12	120	5.0	
74-93-1	Methyl Mercaptan	11,000	9.8	5,500	5.0	
75-08-1	Ethyl Mercaptan	390	13	150	5.0	
75-18-3	Dimethyl Sulfide	41,000	13	16,000	5.0	
75-15-0	Carbon Disulfide	280	7.8	90	2.5	
75-33-2	Isopropyl Mercaptan	1,500	16	470	5.0	
75-66-1	tert-Butyl Mercaptan	2,700	18	730	5.0	
107-03-9	n-Propyl Mercaptan	170	16	55	5.0	
624-89-5	Ethyl Methyl Sulfide	460	16	150	5.0	
110-02-1	Thiophene	1,800	17	530	5.0	
513-44-0	Isobutyl Mercaptan	560	18	150	5.0	\mathbf{W}
352-93-2	Diethyl Sulfide	72	18	20	5.0	
109-79-5	n-Butyl Mercaptan	260	18	72	5.0	
624-92-0	Dimethyl Disulfide	310	9.6	82	2.5	
616-44-4	3-Methylthiophene	520	20	130	5.0	
110-01-0	Tetrahydrothiophene	93	18	26	5.0	
638-02-8	2,5-Dimethylthiophene	42	23	9.1	5.0	
872-55-9	2-Ethylthiophene	45	23	9.8	5.0	
110-81-6	Diethyl Disulfide	ND	12	ND	2.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.



Page 1 of 1

Client: Aquaterra Environmental Solutions, Inc.

Client Sample ID: CW-5 CAS Project ID: P1104362 Client Project ID: CH RDF Flare Gas Sample / 4733.10 CAS Sample ID: P1104362-002

Test Code: ASTM D 5504-08

Instrument ID:

Analyst: Lauryn Keeler Sampling Media: 1 L Zefon Bag

Test Notes:

Agilent 7890A/GC22/SCD Time Collected: 16:20 Date Received: 11/9/11 Date Analyzed: 11/9/11

Time Analyzed: 12:58

Date Collected: 11/8/11

Volume(s) Analyzed: 1.0 ml(s)

CAS#	Compound	Result	MRL	Result	MRL	Data
		$\mu g/m^3$	$\mu g/m^3$	ppbV	ppbV	Qualifier
7783-06-4	Hydrogen Sulfide	33,000	7.0	24,000	5.0	
463-58-1	Carbonyl Sulfide	300	12	120	5.0	
74-93-1	Methyl Mercaptan	12,000	9.8	6,200	5.0	
75-08-1	Ethyl Mercaptan	430	13	170	5.0	
75-18-3	Dimethyl Sulfide	41,000	13	16,000	5.0	
75-15-0	Carbon Disulfide	290	7.8	92	2.5	
75-33-2	Isopropyl Mercaptan	1,600	16	520	5.0	
75-66-1	tert-Butyl Mercaptan	2,800	18	760	5.0	
107-03-9	n-Propyl Mercaptan	200	16	63	5.0	
624-89-5	Ethyl Methyl Sulfide	460	16	150	5.0	
110-02-1	Thiophene	2,000	17	580	5.0	
513-44-0	Isobutyl Mercaptan	570	18	160	5.0	\mathbf{W}
352-93-2	Diethyl Sulfide	71	18	19	5.0	
109-79-5	n-Butyl Mercaptan	290	18	79	5.0	
624-92-0	Dimethyl Disulfide	210	9.6	54	2.5	
616-44-4	3-Methylthiophene	540	20	130	5.0	
110-01-0	Tetrahydrothiophene	88	18	25	5.0	
638-02-8	2,5-Dimethylthiophene	51	23	11	5.0	
872-55-9	2-Ethylthiophene	60	23	13	5.0	
110-81-6	Diethyl Disulfide	ND	12	ND	2.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.



Page 1 of 1

Client: Aquaterra Environmental Solutions, Inc.

Client Sample ID: CW-6 CAS Project ID: P1104362 Client Project ID: CH RDF Flare Gas Sample / 4733.10 CAS Sample ID: P1104362-003

Test Code: ASTM D 5504-08

Instrument ID: Agilent 7890A/GC22/SCD

Analyst: Lauryn Keeler Sampling Media: 1 L Zefon Bag

Test Notes:

Date Collected: 11/8/11 Time Collected: 16:25 Date Received: 11/9/11

> Date Analyzed: 11/9/11 Time Analyzed: 13:16

Volume(s) Analyzed: 1.0 ml(s)

CAS#	Compound	Result	MRL	Result	MRL	Data
		μg/m³	μg/m³	ppbV	ppbV	Qualifier
7783-06-4	Hydrogen Sulfide	33,000	7.0	23,000	5.0	
463-58-1	Carbonyl Sulfide	280	12	110	5.0	
74-93-1	Methyl Mercaptan	12,000	9.8	6,000	5.0	
75-08-1	Ethyl Mercaptan	420	13	170	5.0	
75-18-3	Dimethyl Sulfide	39,000	13	16,000	5.0	
75-15-0	Carbon Disulfide	270	7.8	88	2.5	•
75-33-2	Isopropyl Mercaptan	1,500	16	500	5.0	
75-66-1	tert-Butyl Mercaptan	2,700	18	720	5.0	
107-03-9	n-Propyl Mercaptan	190	16	60	5.0	
624-89-5	Ethyl Methyl Sulfide	450	16	140	5.0	
110-02-1	Thiophene	1,900	17	560	5.0	
513-44-0	Isobutyl Mercaptan	550	18	150	5.0	\mathbf{W}
352-93-2	Diethyl Sulfide	64	18	17	5.0	
109-79-5	n-Butyl Mercaptan	290	18	78	5.0	
624-92-0	Dimethyl Disulfide	190	9.6	49	2.5	
616-44-4	3-Methylthiophene	530	20	130	5.0	
110-01-0	Tetrahydrothiophene	88	18	24	5.0	
638-02-8	2,5-Dimethylthiophene	47	23	10	5.0	
872-55-9	2-Ethylthiophene	56	23	12	5.0	
110-81-6	Diethyl Disulfide	ND	12	ND	2.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.



Page 1 of 1

Client: Aquaterra Environmental Solutions, Inc.

Client Sample ID: Method Blank CAS Project ID: P1104362 Client Project ID: CH RDF Flare Gas Sample / 4733.10 CAS Sample ID: P111109-MB

Test Code: ASTM D 5504-08

Instrument ID: Agilent 7890A/GC22/SCD

Analyst: Lauryn Keeler Sampling Media: 1 L Zefon Bag

Test Notes:

Time Collected: NA Date Received: NA Date Analyzed: 11/09/11 Time Analyzed: 09:18

Date Collected: NA

Volume(s) Analyzed: 1.0 ml(s)

CAS#	Compound	Result μg/m³	MRL μg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	7.0	ND	5.0	Quantier
463-58-1	Carbonyl Sulfide	ND	12	ND	5.0	
74-93-1	Methyl Mercaptan	ND	9.8	ND	5.0	
75-08-1	Ethyl Mercaptan	ND	13	ND	5.0	
75-18-3	Dimethyl Sulfide	ND	13	ND	5.0	
75-15-0	Carbon Disulfide	ND	7.8	ND	2.5	
75-33-2	Isopropyl Mercaptan	ND	16	ND	5.0	
75-66-1	tert-Butyl Mercaptan	ND	18	ND	5.0	
107-03-9	n-Propyl Mercaptan	ND	16	ND	5.0	
624-89-5	Ethyl Methyl Sulfide	ND	16	ND	5.0	
110-02-1	Thiophene	ND	17	ND	5.0	
513-44-0	Isobutyl Mercaptan	ND	18	ND	5.0	
352-93-2	Diethyl Sulfide	ND	18	ND	5.0	
109-79-5	n-Butyl Mercaptan	ND	18	ND	5.0	
624-92-0	Dimethyl Disulfide	ND	9.6	ND	2.5	
616-44-4	3-Methylthiophene	ND	20	ND	5.0	
110-01-0	Tetrahydrothiophene	ND	18	ND	5.0	
638-02-8	2,5-Dimethylthiophene	ND	23	ND	5.0	
872-55-9	2-Ethylthiophene	ND	23	ND	5.0	
110-81-6	Diethyl Disulfide	ND	12	ND	2.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.



LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

Aquaterra Environmental Solutions, Inc. Client:

Client Sample ID: Lab Control Sample CAS Project ID: P1104362 Client Project ID: CH RDF Flare Gas Sample / 4733.10 CAS Sample ID: P111109-LCS

Test Code: ASTM D 5504-08 Date Collected: NA

Agilent 7890A/GC22/SCD Instrument ID: Date Received: NA Lauryn Keeler Analyst: Date Analyzed: 11/09/11

Sampling Media: 1 L Zefon Bag Volume(s) Analyzed: NA ml(s)

Test Notes:

					CAS	
CAS#	Compound	Spike Amount	Result	% Recovery	Acceptance	Data
		ppbV	${f ppbV}$		Limits	Qualifier
7783-06-4	Hydrogen Sulfide	2,380	2,040	86	51-141	
463-58-1	Carbonyl Sulfide	2,470	1,940	79	63-147	
74-93-1	Methyl Mercaptan	2,360	2,290	97	54-156	

APPENDIX C CALCULAITONS



Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, Illinois

Input

Sample No. CW-1

Date Collected 6/7/2011

Percent Methane: 51.4 Percent
Net heat of combustion of methane* 802 KJ/g mole

Net Heating Value calculated using the following equation:

HT = K ∑CiHi

where:

H (T): Net Heating Value in (MJ/scm) at 25 deg. C, 760 mm Hg

K: 1.740x10⁻⁷ (1/ppm)(g mole/scm)(MJ/kcal)

where (g mole/scm) is at 20 deg. C

Ci: concentration of component sample component i in ppm

Hi: net heat of combustion for sample component i

in (kcal/g mole) at 25 deg. C, 760 mm Hg

Convert Heat of Combustion from Btu/scf to kcal/g mole

A) KJ/mol to J/mol

(802 kJ/g mole)*(1000 J/1 kJ) = 802,000 J/g mole

B) J/mole to cal/mole

(802,000 J/g mole)*(1 cal/4.184 J)= 191,682.6 cal/g mole

C) cal/mole to Kcal/mole

(191,682 cal/g mole)*(1 Kcal/1000 cal)= 191.7 kcal/g mole

Now calculate Net Heating Value

HT = K ∑CiHi

 $H(T) = 1.740 \times 10-7 (1/ppm)(g mole/scm)(MJ/kcal) \times 514000 ppm \times 191.7 kcal/g-mole$

H(T) = 17.14 MJ/scm

^{*} Value from Chemistry: The Central Science 2nd Edition, by Theodore L. Brown and H. Eugene LeMay, Jr.

Waste Management, Inc. Cottonwood Hills Recycling and Disposal Facility Marissa, Illinois

Input

Sample No. CW-2
Date Collected 6/7/2011

Percent Methane: 57.13 Percent
Net heat of combustion of methane* 802 KJ/g mole

Net Heating Value calculated using the following equation:

HT = K ∑CiHi

where:

H (T): Net Heating Value in (MJ/scm) at 25 deg. C, 760 mm Hg

K: 1.740x10⁻⁷ (1/ppm)(g mole/scm)(MJ/kcal)

where (g mole/scm) is at 20 deg. C

Ci: concentration of component sample component i in ppm

Hi: net heat of combustion for sample component i in (kcal/g mole) at 25 deg. C, 760 mm Hg

Convert Heat of Combustion from Btu/scf to kcal/g mole

A) KJ/mol to J/mol

(802 kJ/g mole)*(1000 J/1 kJ) = 802,000 J/g mole

B) J/mole to cal/mole

(802,000 J/g mole)*(1 cal/4.184 J)= 191,682.6 cal/g mole

C) cal/mole to Kcal/mole

(191,682 cal/g mole)*(1 Kcal/1000 cal)= 191.7 kcal/g mole

Now calculate Net Heating Value

HT = K ∑CiHi

 $H(T) = 1.740 \times 10-7 (1/ppm)(g mole/scm)(MJ/kcal) \times 571300 ppm \times 191.7 kcal/g-mole$

H (T) = 19.06 MJ/scm

^{*} Value from Chemistry: The Central Science 2nd Edition, by Theodore L. Brown and H. Eugene LeMay, Jr.

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, Illinois

Input

Sample No. CW-4

Date Collected: 10/26/2011

Percent Methane: 49.41 Percent
Net heat of combustion of methane* 802 KJ/g mole

Net Heating Value calculated using the following equation:

HT = K ∑CiHi

where:

H (T): Net Heating Value in (MJ/scm) at 25 deg. C, 760 mm Hg

K: 1.740x10⁻⁷ (1/ppm)(g mole/scm)(MJ/kcal)

where (g mole/scm) is at 20 deg. C

Ci: concentration of component sample component i in ppm

Hi: net heat of combustion for sample component i

in (kcal/g mole) at 25 deg. C, 760 mm Hg

Convert Heat of Combustion from Btu/scf to kcal/g mole

A) KJ/mol to J/mol

(802 kJ/g mole)*(1000 J/1 kJ) = 802,000 J/g mole

B) J/mole to cal/mole

(802,000 J/g mole)*(1 cal/4.184 J)= 191,682.6 cal/g mole

C) cal/mole to Kcal/mole

(191,682 cal/g mole)*(1 Kcal/1000 cal)= 191.7 kcal/g mole

Now calculate Net Heating Value

HT = K ∑CiHi

 $H(T) = 1.740 \times 10-7 (1/ppm)(g mole/scm)(MJ/kcal) \times 494100 ppm \times 191.7 kcal/g-mole$

H(T) = 16.48 MJ/scm

^{*} Value from Chemistry: The Central Science 2nd Edition, by Theodore L. Brown and H. Eugene LeMay, Jr.

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, Illinois

Input

Sample No. CW-5

Date Collected: 10/26/2011

Percent Methane: 49.25 Percent
Net heat of combustion of methane* 802 KJ/g mole

Net Heating Value calculated using the following equation:

HT = K ∑CiHi

where:

H (T): Net Heating Value in (MJ/scm) at 25 deg. C, 760 mm Hg

K: 1.740x10⁻⁷ (1/ppm)(g mole/scm)(MJ/kcal)

where (g mole/scm) is at 20 deg. C

Ci: concentration of component sample component i in ppm

Hi: net heat of combustion for sample component i

in (kcal/g mole) at 25 deg. C, 760 mm Hg

Convert Heat of Combustion from Btu/scf to kcal/g mole

A) KJ/mol to J/mol

(802 kJ/g mole)*(1000 J/1 kJ) = 802,000 J/g mole

B) J/mole to cal/mole

(802,000 J/g mole)*(1 cal/4.184 J)= 191,682.6 cal/g mole

C) cal/mole to Kcal/mole

(191,682 cal/g mole)*(1 Kcal/1000 cal)= 191.7 kcal/g mole

Now calculate Net Heating Value

HT = K ∑CiHi

 $H(T) = 1.740 \times 10-7 (1/ppm)(g mole/scm)(MJ/kcal) \times 492500 ppm \times 191.7 kcal/g-mole$

H(T) = 16.43 MJ/scm

^{*} Value from Chemistry: The Central Science 2nd Edition, by Theodore L. Brown and H. Eugene LeMay, Jr.

Waste Management, Inc. Cottonwood Hills Recycling and Disposal Facility Marissa, Illinois

Input

Sample No. CW-6 Date Collected: 10/26/2011

Percent Methane: 48.72 Percent Net heat of combustion of methane* 802 KJ/g mole

Net Heating Value calculated using the following equation:

HT = K ∑CiHi

where:

H (T): Net Heating Value in (MJ/scm) at 25 deg. C, 760 mm Hg

K: 1.740x10⁻⁷ (1/ppm)(g mole/scm)(MJ/kcal) where (g mole/scm) is at 20 deg. C

Ci: concentration of component sample component i in ppm

Hi: net heat of combustion for sample component iin (kcal/g mole) at 25 deg. C, 760 mm Hg

Convert Heat of Combustion from Btu/scf to kcal/g mole

A) KJ/mol to J/mol

(802 kJ/g mole)*(1000 J/1 kJ) = 802,000 J/g mole

B) J/mole to cal/mole

(802,000 J/g mole)*(1 cal/4.184 J)= 191,682.6 cal/g mole

C) cal/mole to Kcal/mole

(191,682 cal/g mole)*(1 Kcal/1000 cal)= 191.7 kcal/g mole

Now calculate Net Heating Value

HT = K ∑CiHi

 $H(T) = 1.740 \times 10-7 (1/ppm)(g mole/scm)(MJ/kcal) \times 487200 ppm \times 191.7 kcal/g-mole$

H(T) =16.25 MJ/scm

^{*} Value from Chemistry: The Central Science 2nd Edition, by Theodore L. Brown and H. Eugene LeMay, Jr.